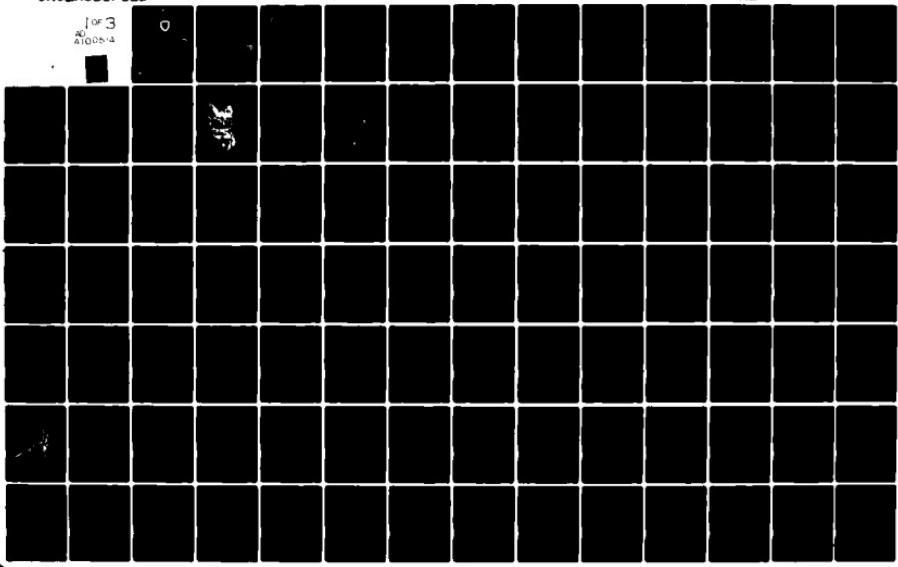


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MANUFACTURING METHODS & TECHNOLOGY PROGRAM PLAN, CY 1981.(U)
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MATERIEL DEVELOPMENT AND READINESS COMMAND



MANUFACTURING METHODS & TECHNOLOGY

PROGRAM PLAN

CY 1981

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MAY 1981

MANUFACTURING TECHNOLOGY DIVISION
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ROCK ISLAND, ILLINOIS 61299

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DRCMT

DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA. 22333

14 MAY 1981

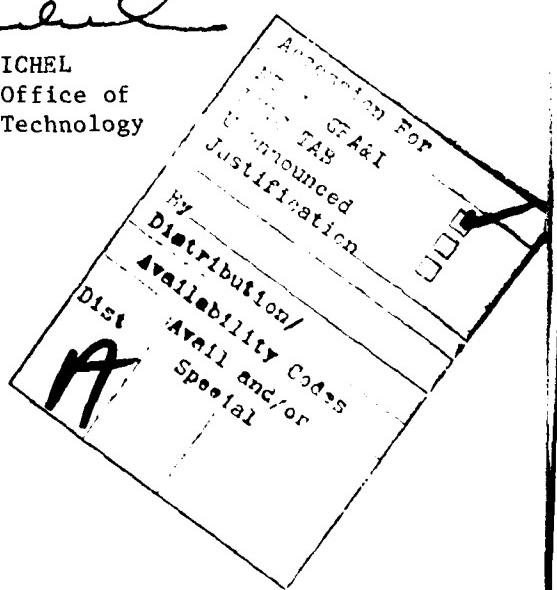
SUBJECT: 1981 DARCOM MMT Program Plan

SEE DISTRIBUTION (Appendix D)

1. Reference draft AR 700-90, Army Industrial Preparedness Program, para 3-8c(2), dated 24 June 1980.
2. The subject document submitted IAW reference in paragraph 1, describes the DARCOM Manufacturing Methods and Technology (MMT) Program for the period FY81-85. This plan was compiled by amending planning data submitted during January-February 1981. The amendments take into account subsequent programming actions taken since February; namely, FY81 project approvals and FY82 apportionment submissions.
3. Because of the dynamic nature of military materiel requirements and the constant change in technology, the inclusion of a project in this plan is not a guarantee of funding. However, the plan does indicate the current technology needs and interests of the DARCOM community.
4. Additional copies of this document may be obtained by writing the Defense Technical Information Center, ATTN: DTIC-TSR-1, Cameron Station, Alexandria, VA 22314

1 Incl
CY1981 DARCOM
MMT Program Plan

FREDERICK J. MICHEL
Acting Chief, Office of
Manufacturing Technology



FOREWARD

This document presents information for the DARCOM Manufacturing Methods and Technology (MMT) Program for Fiscal Years 1981-1985. The projects and funding levels for the out-years are for planning purposes only and will change based on technological developments and revisions in program requirements. Since total funding for these planned projects exceeds the projected funds for the Army's MMT Program, some projects will not be funded or may be slipped to later fiscal years. HQ, DARCOM and its subcommands and centers have the authority to reprogram funds to projects with higher priority, thereby affording the flexibility to accommodate new opportunities as they arise.

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INTRODUCTION

The MMT Program Plan

The MMT Program Plan, CY 1981, provides within a single source a summary of current and near-term efforts (FY81-FY85) included in the DARCOM MMT Program. Since weapons systems requirements and the technology for these systems are constantly changing, inclusion in the Program Plan is not a guarantee that an individual project will be funded. However, the Plan does serve as an indicator of the areas towards which DARCOM's resources will be directed and the magnitude of the Army's commitment to this program.

Organization of the MMT Program Plan

The Plan provides a section for each DARCOM element which has projects in the FY 81-85 period. Each section includes a summary of the activity, its responsibilities, and its major MMT thrust areas. Following this summary is a listing of each project proposed by that activity.

Individual project information is presented by the last four digits of the project number and includes the project title, funding, a brief description of the problem addressed by the project and the proposed solution. Projects are grouped according to broad categories and then further subdivided according to component. This arrangement points out major areas of emphasis and aids the identification of possible duplication of effort.

Industry Guide

An Industry Guide (Appendix A) has been included to aid in the use of the plan. The section will help clarify the interrelationships between the appropriations, commands, and personnel involved in the DARCOM MMT Program.

PROGRAM IMPACT

The MMT Program

The Manufacturing Methods and Technology (MMT) Program serves the US Army Materiel Development and Readiness Command (DARCOM) as a bridge between research and development and production. The program's primary aim is to reduce the cost of weapons system acquisition by improving the efficiency of manufacturing processes and by implementing new technology. Although cost reduction is a primary concern, the emphasis is also directed toward efforts reducing air and water pollution, increasing safety, conserving energy, reducing dependency on critical material, improving producibility and increasing productivity.

Need for MMT

The United States is in a period of low productivity growth with accompanying increased costs. The MMT Program is a major DOD tool to improve productivity and lower end item and spare/repair parts costs. The following excerpts illustrate the emphasis being given to the MMT Program by DOD and DARCOM.

Excerpt from the Overview Statement by the Under Secretary of Defense Research and Engineering to the 96th Congress, Second Session, 1980:

"Technology is being used as a tool to achieve major cost reductions in manufacturing complex weapons systems and high-quality production hardware in several important ways: improvements in productivity and yield (e.g., computer-aided manufacturing), conservation of strategic materials resulting in reduced production lead times and costs (e.g., "near net shape" fabrication methods and substitution with less critical materials and composites); greater productivity (e.g., improvements in safety, pollution abatement, and energy use); and reliability through improved inspection and quality assurance methods. The Manufacturing Technology Program, a top priority program for increasing the introduction of innovation in the defense industrial procurement program, is funded at 150 million in FY81, representing approximately 0.4 percent of the defense procurement program".

Excerpts from the "Department of Defense Statement on the Science and Technology Program" by the Deputy Under Secretary of Defense for Research and Advanced Technology before the Research and Development Subcommittee of the Committee on Armed Services of the US Senate 96th Congress, Second Session, 5 March 1980:

1. "In addition to multiplying our force effectiveness through improved performance, new technology is required to address defense costs, acquisition barriers, and readiness. Requirements that must be addressed by technical solutions include: improved reliability (which is "designed-in"

and "manufactured-in" not just "tested-in"); life extension and durability of costly military hardware; conservation, substitution, and recycling technologies for critical material; increased productivity and reduced manufacturing cost in our defense industrial base; the capability to substitute synthetic fuels for petroleum-based fuels; and improved human engineering to better match operational demands of new equipment to training and readiness levels. Advanced Technology Developments and the Manufacturing Technology Program provide great potential for meeting these requirements and accordingly deserve stronger emphasis in the future than is represented in our FY 1981 budget request. I intend to continue to give strong emphasis to these important elements of the S&T Program as well as . . ."

2. "Much attention has been given to the lack of increased productivity and innovation within US industry. Probably the single most effective program within the DOD to attack this problem and to improve our defense industrial preparedness is the Manufacturing Technology Program. We are working very closely with the military departments and with industry to further strengthen the program. We are striving to provide better visibility for active and completed projects to better articulate the cost savings and productivity improvements which accrue to the DOD (and to the American industry in general)".

3. "The Manufacturing Technology Program (MTP) is an aggressive DOD initiative to exploit innovative manufacturing concepts which show potential to reduce material acquisition costs and to improve industrial productivity . . ."

Excerpts from, "The Department of Defense Statement on Industrial Readiness" by the Under Secretary of Defense for Research and Engineering, before the Defense Industrial Base Panel of the Committee on Armed Services, United States House of Representatives 96th Congress, Second Session, 3 December 1980:

1. "The DOD Manufacturing Technology Program is clearly an extremely important vehicle for improving the health of industry, and one which I fully support . . ."

2. "I consider that my principle proposal as a manager in a defense program is to focus emphasis, to focus priority on the issues that I think are most important. And in the Technology Base I have chosen to focus those on three areas. One of them which you are well familiar with is the very high-speed integrated circuits. A second is the manufacturing technology program which GEN Slay described to you. And the third, which I pull out as a separate item, although it is part of manufacturing technology, is this rapid-solidification technology . . ."

Excerpt from a statement by General John R. Guthrie, Commanding General, US Army Materiel Development and Readiness Command before the Industry Preparedness Panel of the House Armed Services Committee, Second Session, 96th Congress, 14 November 1980:

"In this latter regard, I would like to comment on two points which were raised by the Defense Science Board last summer and which I believe Dr. Fuhrman addressed in his testimony before the panel in September.

"The first point concerns service Manufacturing Technology (MANTECH) Programs. In his statement, Dr. Fuhrman said that the DSB recommended that a reasonable portion of each service's procurement budget be devoted to MANTECH Programs. Although he did not specify a percentage, the DSB, in its report, called for annually funding MANTECH to 1% of each service's procurement budget.

"While I understand and support the thrust of the DSB's effort to index MANTECH to procurement expenditures, I suggest that a 1% level may be inadequate. Based on the potential benefits and merits of the project proposals submitted to us on the opportunities we envision, I would be quite willing to see the funding level rise to some 2%, or possibly higher when special opportunities arise and are fully justified.

"Further whatever base percentage is finally agreed upon, I believe that figure should represent a floor which should not be breached by DOD or any other services: . . ."

This strong emphasis was reiterated by General Guthrie during an appearance before the Industrial Preparedness Panel of the House Armed Services Committee, First Session, 97th Congress on 30 April 1981.

New Systems

An expanded MMT program is necessary to support the production base being established for the new systems of the 1980's required to modernize our forces and improve readiness. These systems will run the gamut from tanks to helicopters to ammunition, missiles and vehicles. A new tank, the M-1, is now coming off the assembly line. In addition, the Army will have a new fighting vehicle for infantry. Two new helicopters, one devastating against armor and the other vital to our mobility and logistics, will be built. The latter, the Blackhawk, has already been fielded. Also developed in the last few years and entering into production is a laser-homing artillery shell capable of first round hits against moving targets at 15km. The Artillery will be receiving its first multiple rocket launcher capability in 30 years. The Airborne and Air Mobile Forces are being given the first new Howitzer, the M198, since World War II.

In the area of air defense, development has been completed and fielding of the Patriot missile system has begun. Another new air defense system that will be fielded is the Roland. Also under development is the Division Air Defense Gun.

Command Systems include an integrated Army tactical communications objective system (INTACS) which consists primarily of equipment systems developed under TRI-TAC, TACSAT, SINCGARS, and associated COMSEC programs that will provide for responsive, secure, jam-resistant, mobile and highly automated tactical communications. The Army Helicopter Improvement Program (AHIP) is in support of intelligence, surveillance and target acquisitions. This program is looking at the OH-6 and OH-58 as candidates for an interim Scout helicopter. Following the AHIP Program, if cost justifiable, the advance Scout helicopter will be pursued with a new air frame designed specifically for the Scout mission. Also, currently being developed is a remotely piloted vehicle to provide surveillance and target designation behind enemy lines. The Army is fielding its firefighter radar systems which are capable of detecting incoming mortar artillery and free rockets and provide instant target data on point of origin before the incoming rounds hit. In the air, the stand-off target acquisition system (SOTAS) mounted on a Blackhawk helicopter will be able to detect and locate moving targets, targets which are miles behind enemy lines, from a relatively safe position behind our line.

The combat support mission area planning trends in the engineering area include: a "combat excavator" for rapid field fortification construction; soil stabilization system; logistic-over-the-shore (LOTS) operation; rapidly implaced water storage bladders and hoselines; mobile welldrilling equipment; waste water reuse equipment and improved filtering of saline and NBC contaminated water; new wet-and dry-gap bridges; and rapid crossing sites access/egress systems.

In the mine/countermine area, Army is developing a family of scatterable mines (FASCAM), which allows rapid delivery of massive amounts of antitank and antipersonnel mines by artillery, aircraft, or ground distribution. In the countermine area, Army is developing a surface-launched fuel air explosive, that uses the devastating shock of fuel air explosive to rapidly clear paths in the minefields. A mine clearing roller has just been fielded which attaches to the point of the main battle tank and is capable of safely detonating and clearing any known pressure-sensitive mine.

In the area of night vision, Army is in the third generation of passive night vision devices, popularly known as starlight scopes. The size and weight has been reduced and the blooming problem caused by sudden bright light such as flares or muzzle flashes has been reduced. Developments in the night observation area will include: development of third generation light amplification devices, focal plane arrays for thermal imaging, millimeter wave radars and CO₂ laser for target acquisition and fire control.

Procurement of various size generators has continued to provide general purpose power sources for field units. In addition, the DOD family of standard generators and associated equipment will be utilized to provide power sources for PATRIOT, CHAPARRAL, TACFIRE, HAWK, and a variety of other missile and air defense systems. Initial procurement of the silent lightweight electrical energy plant (SLEEP) model begins in FY84, and continues with the 3 KW, 5 KW, and 10 KW during the next 10 years.

MMT Thrusts

The thrusts of the program are divided into two categories. The first category - Program Thrusts - is aimed at improving the overall management of the program. It is aimed at getting the most out of the program, both for Army and the industrial base, per dollar expended. The second category - Technology Thrusts - is aimed at the technical areas important to fielding the weapons systems of the 1980's.

Program Thrusts

Support Procurement
Improve Implementation
Identify Cost Drivers
Apply Foreign Technology
Improve Technology Transfer

Technology Thrusts

Large Scale Integration (LSI)	Flexible Machining Systems
Very High Speed Integrated Circuits (VHSI)	Group Technology
Gradient Index Optics	Computer Aided Design and Manufacturing
Silicon on Sapphire (SOS)	Computer Integrated Manufacturing
Fiber Optics	Robotics
Pressed Lenses	Laser Applications
Plastic Optics	Materials Substitution
Chalcogenide Glass Optics	Near Net Shape Processing
High Frequency Gallium Arsenide	Surface Treatment
Microwave Integrated Circuits	Joining-Automated Control
Composites	Ceramics
Air and Water Pollution Abatement	Metal Removal
Energy Conservation	High Speed Machining
Recycling	Powder Metallurgy
Demilitarization	Safety
Flexible Ammo Metal Parts Lines	Ammunition Cast and Press Loading
Automated Material Handling	Automated Test and Inspection

SUMMARY

**SUBMACOM SUBMISSION TO MMT PROGRAM
BY COMMAND (Thousands of Dollars)**

<u>Command</u>	<u>Fiscal Code</u>	<u>Appropriation</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
ARRADCOM/ARRCOM	4250	Ammunition	25999	30383	31109	32330	40749
	3297	Weapons	7082	10733	14831	19235	15839
	5397	Other Support	3291	3174	2236	5855	5460
AVRADCOM	1497	Aircraft	9843	13009	15285	17825	19685
CECOM	5297	Communications/Electronics	4281	2892	5812	4950	1000
ERADCOM	5297	Communications/Electronics	4904	7212	15550	18950	14500
DARCOM/AMMRC	5397	Other Support	4783	5580	5850	6350	6350
MICOM	1497	Aircraft	0	0	400	0	0
	2597	Missiles	15888	12156	25055	29372	26215
	4250	Ammunition	915	0	1300	1225	950
	5297	Communications/Electronics	0	0	0	250	250
	5397	Other Support	661	800	800	800	800
MERADCOM	5397	Other Support	1379	0	3127	1227	814
	3197	Tracked Combat Vehicles	0	968	808	948	0
TACOM	3197	Tracked Combat Vehicles	6114	14955	23693	26330	27867
	5197	Tactical & Support Vehicles	737	967	1005	2240	1325
TECOM	5397	Other Support	750	1010	1300	1400	1500

SUBMACOM SUBMISSION TO MNT PROGRAM
BY APPROPRIATION (Thousands of Dollars)

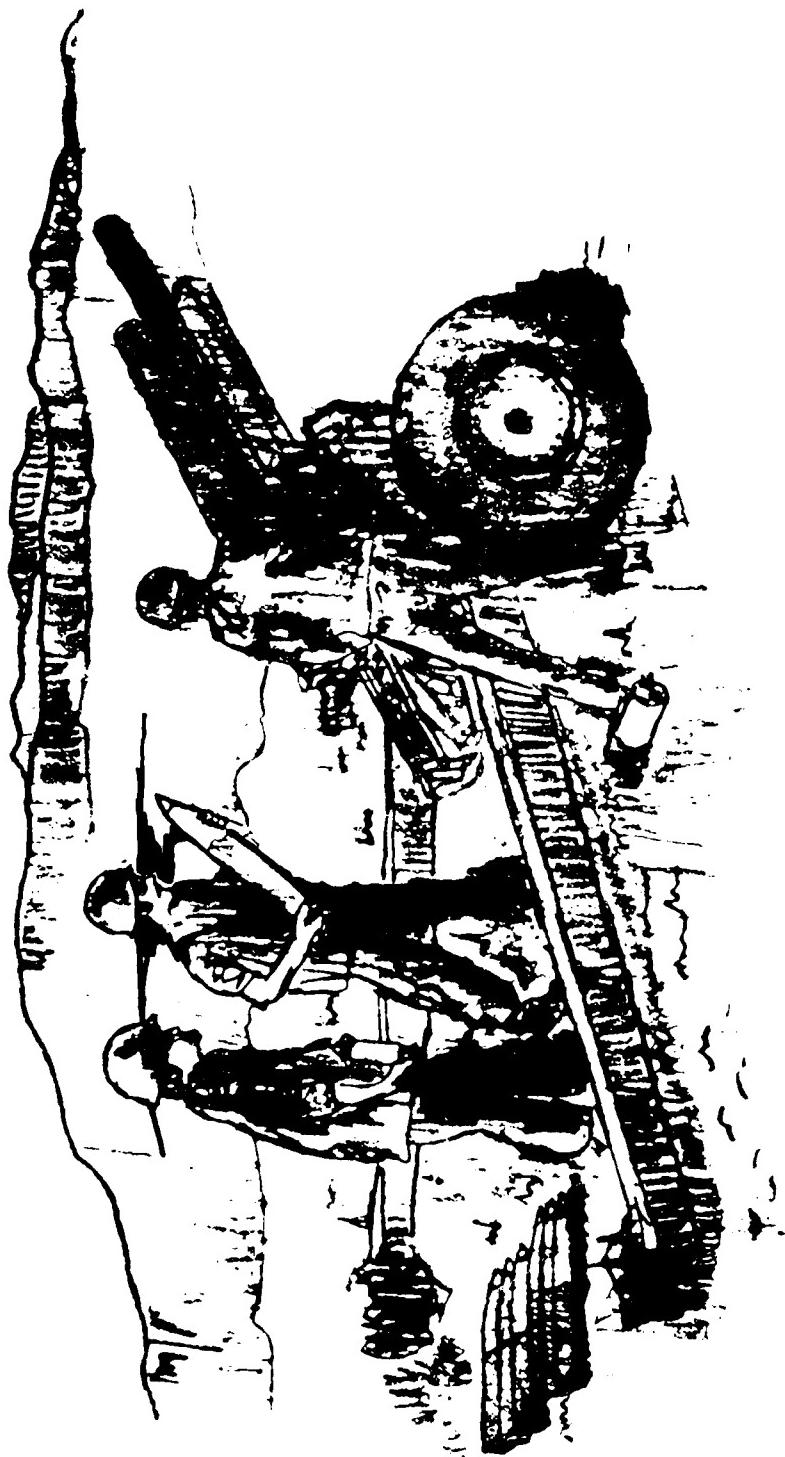
<u>Appropriation</u>	<u>Fiscal Code</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Aircraft	1497	9843	13009	15685	17825	19685
Missiles	2597	15888	12156	25055	29372	26215
Tracked Combat Vehicles	3197	6114	15923	24501	27278	27867
Weapons and Other Combat Vehicles	3297	7082	10733	14831	19235	15839
Ammunition	4250	26914	30383	32409	33555	41699
Tactical and Support Vehicles	5197	737	967	1005	2240	1325
Communications/Electronics	5297	9185	10104	21362	24150	15750
Other Support Equipment	5397	10864	10564	13313	15632	14924
TOTALS	86627	103839	148161	169287	163304	

ANALYSIS OF PREVIOUS PLANNING DATA

CY of Plan	Percent of Submission Previously Planned	
	Period Covered*	FY82 Apportionment
1976	FY78 - FY82	16.0%
1977	FY79 - FY83	19.6%
1978	FY80 - FY84	29.0%
1979	FY79 - FY83*	40.1%
1980	FY80 - FY84	88.9%

This chart shows the percentage of projects currently in the review cycle which were planned in previous years' long range plans.

*Starting in 1979, the planning period covered was changed to reflect the more immediate future, rather than the POM years.



**ARMAMENT R&D COMMAND
(ARRADCOM)**

**ARMAMENT MATERIEL READINESS COMMAND
(ARRCOM)**

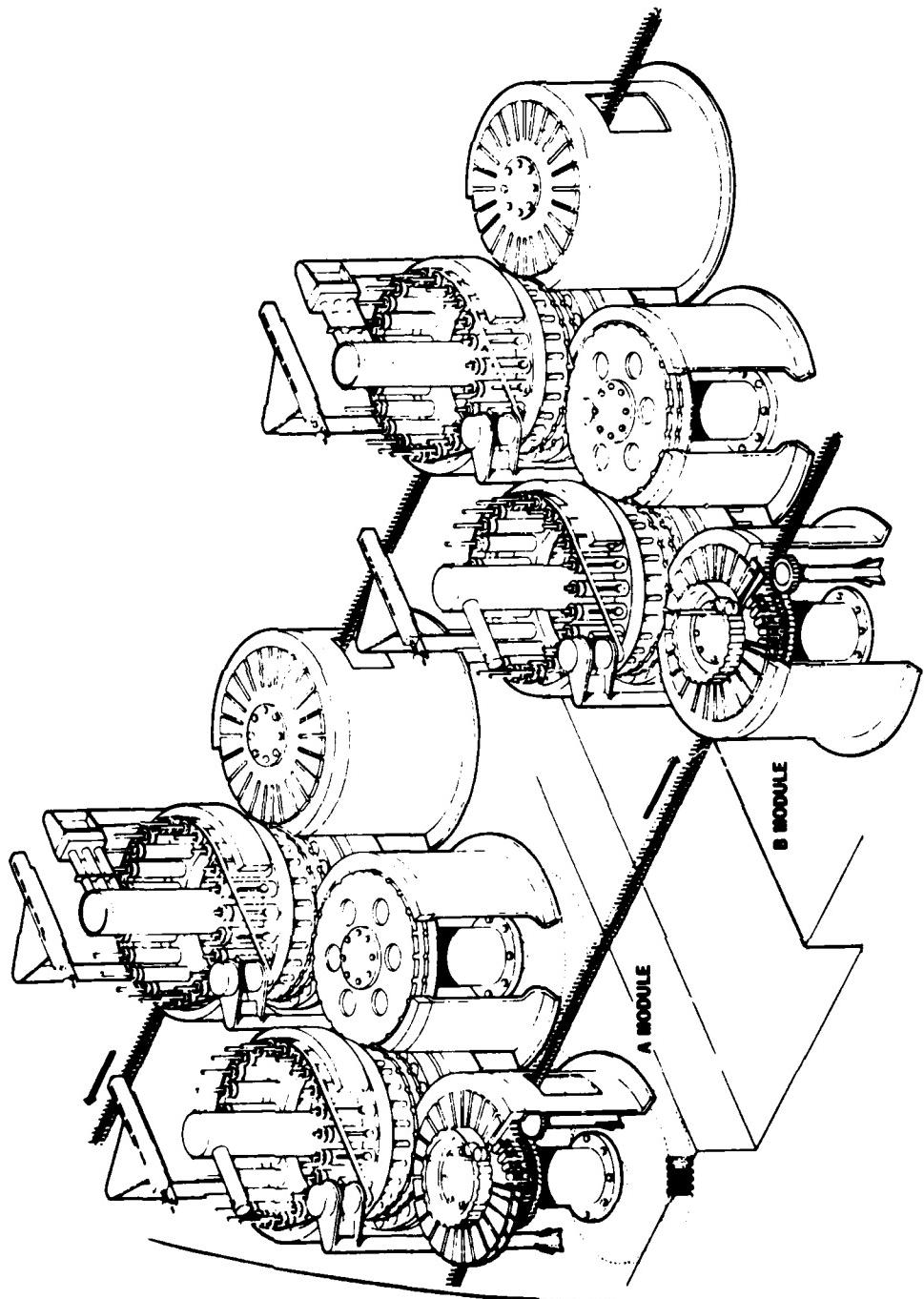
US ARMY ARMAMENT MATERIEL READINESS COMMAND (ARRCOM)
AND
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND (ARRADCOM)

ARRCOM, with headquarters at Rock Island, IL, is the DOD Single Manager for Conventional Ammunition (SMCA). ARRCOM is responsible for integrated logistics (material readiness) management of nuclear and non-nuclear weapons and munitions. This includes follow-on procurement, production, engineering in support of production, industrial management, product assurance, material management, maintenance, value & logistics engineering, international logistics, and transportation and traffic management for assigned armament systems/materiel. As SMCA, it has responsibility for procurement, production and wholesale management of common-user conventional ammunition for the Army, Navy, and Air Force.

ARRCOM's materiel assignments include artillery, infantry, air defense guns, surface vehicle and aircraft mounted weapons systems, rocket and missile warhead sections, demolition munitions, offensive and defensive chemical materiel and related training equipment, test equipment, and tools. ARRCOM directs operations of four assigned arsenals, a Government-owned, Government-operated ammunition plant, twenty-seven Government-owned, contractor-operated (GOCO) ammunition plants, and an Army ammunition activity.

ARRADCOM is responsible for all research, development, and life cycle engineering of assigned weapon systems. Its mission also includes initial low-rate production for conventional systems and life cycle procurement and production for nuclear munitions. ARRADCOM also executes assigned missions in support of other DOD elements having centralized management responsibility for specific weapons systems or items. In addition to large-caliber, small-caliber, mission support and headquarters staffs at Dover, NJ, command elements include the Chemical Systems Laboratory and the Ballistics Research Laboratory at Aberdeen Proving Ground, MD, and Benet Weapons Laboratory at Watervliet, NY.

Integrated into ARRCOM's structure is the US Army Munitions Production Base Modernization Agency (MPBMA). The Agency is responsible for project management of the Munitions Production Base Modernization Program. The Agency exercises centralized management authority over the planning, direction, control and execution of the Program at all US Army Ammunition Plants and arsenals. A significant amount of interface between the MPBMA, ARRCOM, ARRADCOM, Air Force and Navy is necessary to assure integration of the MMT Program into related modernization plans.



**ARMAMENT R&D COMMAND
ARMAMENT MATERIEL READINESS COMMAND
(ARRADCOM, ARRCOM)
(AMMUNITION)**

<u>CATEGORY</u>	<u>PAGE</u>
Chemical-----	21
Energy Conservation-----	27
Explosives-----	28
Fuzes-----	31
General-----	34
Lap-----	35
Metal Parts-----	43
Pollution Abatement-----	50
Propellants-----	53
Quality Control/Testing-----	58
Safety-----	61
Small Arms-----	63

AMMUNITION PROGRAM

Bridging the technology gap, particularly in those areas that have no civilian counterpart, is a challenging task for the Ammunition MMT Program. In many respects, the Ammunition program presents unique problems which require innovative solutions. Practically all current operations involve a great many hand operations, and methods must be found to efficiently mechanize these. Batch processes must be converted to continuous processes in order to take advantage of new materials handling techniques and to improve the safety of operations.

The primary objective of the Ammunitions Manufacturing Technology Program is to improve existing manufacturing processes, techniques and equipment. The second objective is to bridge the gap between development and full-scale production. The third objective is to solve technological problems identified in the program.

The Manufacturing Methods and Technology effort in the Load, Assemble and Pack area is guided by four major program goals; improved economy of operation, improved safety conditions for operating personnel, establishment of a rapid response production capability, and improvements in the quality of the end product produced. All of these goals must be accomplished within the standards and criteria established for pollution abatement and energy conservation.

Recent changes in policy and guidance have required Process Technology Projects to be cost effective within the timeframe and procurement quantities of the Five Year Defense Plan (FYDPP). The challenge of introducing new technology within this guidance is being met by developing systems with the flexibility to produce many items, establishing an optimum balance between system simplicity and process operational requirements, and providing equipment designs capable of high efficiency operation to achieve cost effective system operations.

Due to the inherently hazardous nature of munitions production, an extensive program has been undertaken to upgrade the safety of explosive preparation equipment, loading equipment, and assembly systems. The MMT Program relating to the upgrading of the operational safety of loading lines is a continuation of current efforts. This program will define and investigate specific operational safety hazards, and will develop equipment and systems to reduce operator exposures and risks.

ARRA[COM FUNDING SUMMARY
COMMAND (THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
CHEMICAL	3796	4140	5036	9735	9145
ENERGY CONSERVATION	1207	1370	1671	1586	4345
EXPLOSIVES	1272	3526	4300	1840	2571
FUZES	1914	0	1075	1697	3365
GENERAL	3951	2960	0	516	970
LAP	4669	7519	4668	4398	6300
METAL PARTS	1367	2356	4092	7560	6217
POLLUTION ABATEMENT	3450	3720	2654	819	0
PROPELLANTS	2772	2739	4277	4335	5555
QUALITY CONTROL/TESTING	2466	1460	1362	1451	3272
SAFETY	1757	2133	850	0	150
SMA LL ARTS	1269	1640	3340	4246	4319
TOTAL	29290	33557	33345	38185	46209

* C A T C H O Y
*-----
* CHEMICAL

FBI FIVE YEAR PLAN
RCS DRC/T 126

COMPONENT -- DECONTAMINATION	(2913) TITLE - SPIN COATING OF DECON AGENT CONTAINERS	FUNDING (\$000.)		
		PRIOR	F1	F2
		337	165	
	PROBLEM - CURRENT METALLIC DECON AGENT CONTAINERS CORRODE BEFORE THE REQUIRED SHELF LIFE OF THE AGENTS IS REACHED. ALTERNATIVE CONTAINERS ARE NOT AVAILABLE. BUT PLASTIC LINERS HAVE BEEN SHOWN TO EXTEND THE LIFE OF CURRENT CONTAINERS SIGNIFICANTLY.			
	SOLUTION - ESTABLISH THE SPIN COATING, OR ROTATIONAL MOLDING, TECHNIQUE FOR COATING THE INSIDE OF CURRENT METALLIC CONTAINERS WITH CHEMICALLY RESISTANT POLYMERS FOR THE PRODUCTION ENVIRONMENT.			
	(2914) TITLE - MFG TECH FOR CLOTHING DECONTAMINATION SYSTEM	600	750	
	PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS ARE BEING IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNTS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE ACCOMPLISHED TO INSURE ECONOMICAL AND BROAD BASED PRODUCTION.			
	SOLUTION - ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA FOR THE PROCESSES AND/OR COMPONENTRY INVOLVED.			
	(2915) TITLE - MFG TECH FOR INTERIOR SURFACE DECONTAMINATION SYSTEM	650	850	
	PROBLEM - PROCESS AND METHODS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED AS THE BASIS FOR PRODUCTION LINE DESIGN. TO INSURE ECONOMICAL AND BROAD-BASED PRODUCTION.			
	SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND OF FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA FOR THE PROCESSES.			
	(2916) TITLE - MFG TECH FOR RAPID DECONTAMINATION APPARATUS	500		
	PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNTS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED TO INSURE ECONOMICAL AND BROAD BASED PRODUCTION.			
	SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND/OR FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA.			

COMPONENT -- INJECTION/WARKING

(205.4) TITLE -- CHEMICAL REMOTE SENSING SYSTEMS

PROBLEM - FIRST GENERATION CHEMICAL REMOTE SENSING SYSTEMS HAVE HIGH FRICUTY. THEY REQUIRE COMPLEX, UNIQUE, SOHISITATED COMPONENTRY WHICH IS NOT AVAILABLE TOO WEST PRODUCTION REQUIREMENTS. COMPONENTS WILL BE HAND FABRICATED FOR INITIAL DEVELOPMENT.

SOLUTION - 1. ORDER FUP PRODUCTION TO BEGIN AS SOON AS POSSIBLE IT IS NECESSARY THAT APPROPRIATE MANUFACTURING TECHNOLOGY START BEING DEVELOPED NOW. CONTRACTORS WITH NECESSARY EXPERIENCE WILL BE UTILIZED TO ESTABLISH PROCEDURES, ETC. FOR QUANTITY MANUFACTURING.

(205.7) TITLE - MFG TECH FOR CM1 AGENT ALARM. XM22.

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING FPP EFFORT AND FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TESTS TOOLING DESIGN DATA.

(206.0) TITLE - MFG TECH AUTOMATIC LIQUID AGENT DETECTOR

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING FPP FUNDS. THERE IS A NEED FOR A TECHNIQUE TO COAT THE CIRCULAR GROOVES CIRC WITH SILVER FLAKES METALLIC PAINT AND STILL OBTAIN THE RESPONSE TIME REQUIRED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES A/D/OK FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-HOUSE TEST, TOOLING DESIGN DATA.

(209.1) TITLE - MFG TECH FOR TBC RECON VEHICLE III

PROBLEM - PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AND CRITICAL COMPONENTS WILL HAVE TO BE ESTABLISHED. TWO CRITICAL COMPONENTS ARE THE MICRO-PROCESSOR AND MASS SPECTROMETER.

SOLUTION - MASS PRODUCTION PROCESSES AND TECHNIQUES MUST BE PROVEN OUT. DESCRIPTIONS OF MANUFACTURE WILL BE FINEARED AND IN-PROCESS TOOLING DATA ESTABLISHED.

COMPONENT	TITLE	FUNDING (\$000)	PERIOD				
			E1	E2	E3	E4	E5
(205.4)	CHEMICAL REMOTE SENSING SYSTEMS	659	1142	2105	659		
(205.7)	MFG TECH FOR CM1 AGENT ALARM. XM22.	1000	1000				
(206.0)	AUTOMATIC LIQUID AGENT DETECTOR	700	500	700			
(209.1)	TBC RECON VEHICLE III	1009	500	1009			

MPT FIVE YEAR PLAN
RCS DRCHT 126

COMPONENT -- FILTERS	TITLE -- MANUFACTURE OF IMPREGNATED CHARCOAL (WHEATERITE)	FUNDING (\$000)				
		PRIOR	81	82	83	84
(0966)	PROBLEM - ONLY ONE COMPANY (CALGEN, INC) SUPPLIES WHETTERITE CHARCOAL AND CONSIDERS ITS PROCESS PROPRIETARY. THIS MATERIAL IS VITAL FOR NEW PROTECTIVE MASKS. A PROCESS MUST BE DEVELOPED TO DIVERSIFY PRODUCTION EAST AND REDUCE COST THROUGH COMPETITION.	235	256	717		
	SOLUTION - MPT PROJECT 5 76-12-96 DEMONSTRATE THAT, USING DILUTE SOLUTIONS OF IODINE, ANTS AND MULTI-STAGE SIZING AND DRYING OF CHARCOAL, SEVERAL CHARCOALS SHOWED DRAMATIC PROTECTION IMPROVEMENT. THIS PROJECT WILL USE THESE RESULTS TO ESTABLISH A PROCESS DESIGN.					
(0967)	TITLE - DISPOSABLE AGENT SCRUBBER	79				
	PROBLEM - ALL EFFLUENTS FROM TEST EQUIPMENT MUST BE COMPLETELY SCRUBBED OF ALL TOXIC MATERIALS. FOR HIGH FLUX THE LIVES OF STANDARD FILTERS ARE TOO SHORT TO BE ECONOMICAL. CHARCOAL SCRUBBERS MUST BE EMPTIED ONCE A DAY WHICH IS A SERIOUS HAZARD TO THE OPERATOR.					
	SOLUTION - THIS PROJECT WILL DEVELOP A DISPOSABLE SCRUBBER WHICH WILL BE ECONOMICALLY HIGH FLUX RATES. THIS SCRUBBER WILL CONSERVE TEST TIME AND ELIMINATE SAFETY HAZARDS. DESIGN WILL BE AS SIMPLE AS POSSIBLE. CONNECTOR WILL BE LEAK PROOF AND RAPIDLY SET UP.					
(0968)	TITLE - POLLUTION ABATEMENT FOR WHEATITE CHARCOAL					
	PROBLEM - THERE IS NO PROVEN PROCESS FOR THE TREATMENT AND DISPOSAL OF THE EFFLUENTS FROM THE MANUFACTURE OF WHEATERIZED CHARCOAL.	793				
	SOLUTION - PROVIDE A PROVEN PROCESS TO TREAT AND DISPOSE OF ALL THE WASTES AND EFFLUENTS OF THE MANUFACTURING PROCESS.					
COMPONENT -- PROCESSES						
(1348)	TITLE - SUPER TROPICAL BLEACH					
	PROBLEM - THERE IS A MAJOR SHORTFALL BETWEEN THE FY74 REQUIREMENTS FOR THIS ITEM AND THE QUANTITY OF IMPORTED CHLORINATED LIME KNOWN TO BE AVAILABLE.					
	SOLUTION - THIS PROJECT WILL PROVIDE THE BASIC DESIGN OF A SUPER TROPICAL BLEACH FACILITY. STUDIES WILL INCLUDE POLLUTION ABATEMENT AND CONTROL EQUIPMENT TO ASSURE COMPLIANCE WITH CSHA AND EPA STANDARDS.					
(1175)	TITLE - HYDROCHLORIC ACID RECOVERY/PROCESSING EVALUATIONS					
	PROBLEM - 3 MILLION LB STOCKPILE OF UNSERVABLE MUNITIONS CONTAIN 1.41 MILLION LB'S OF HE. STOCKPILE WILL GROW BY 5%, OR POUNDS PER YEAR. ENVIRONMENTAL AWARENESS IF HEY IS NOT DISCOVERED.	202				
	SOLUTION - EXPLOIT EXISTING TECHNOLOGY TO RECOVER HE FROM STOCKPILE. RECOVERED HE WILL PROVIDE 46% EFFECT OF HC REQUIREMENT. PROCESS WILL BE USEFUL IN PROCESSING SURFACE RUCHARFS AS WELL.					

FIVE YEAR PLAN
RCS
DRAFT 126

COMPONENT -- PROCESSES

(274) TITLE - TECHNOLOGY DATA BASE FOR CX

PROBLEM - CX (PHOSGENE XAME) IS NOT AVAILABLE COMMERCIALLY OR AT GOCC PLANTS TO SUPPORT USE OF IT'S USE IN THE EINAR IV AMMUNITION PROGRAM. THE TECH DATA BASE IS RESTRICTED TO LABORATORY TECHNOLOGY.

SOLUTION - ESTABLISH OPTIMUM PROCESSES AND OPERATIONAL MODES FOR SCALE-UP TO COMMERCIAL OR GOVERNMENT PRODUCTION FACILITIES.

(275) TITLE - TECHNOLOGY DATA BASE FOR FA4523

PROBLEM - THE DATA BASE FOR FA4523 IS RESTRICTED TO LABORATORY DATA. PILOTING DATA IS LACKING AND INFORMATION FOR ESTIMATING PRODUCTION FACILITIES DOES NOT EXIST AT THIS TIME.

SOLUTION - TO CONDUCT PROCESS STUDIES IN THE PILOT PLANT TO DETERMINE OPTIMUM OPERATING PARAMETERS AND GENERATE DATA TO SUPPORT THE DESIGN OF A PRODUCTION FACILITY.

(276) TITLE - MANUFACTURING TECHNIQUES FOR CR (KID) CONTROL AGENT

PROBLEM - UK PRODUCTION SOURCE NO LONGER EXISTS. THERE IS NO US SOURCE FOR CR AN. NO PRODUCTION TECHNIQUE EXISTS WITHIN THE US.

SOLUTION - FA4523 IS TO ESTABLISH US PILOT PLANT CAP F/MFG OF CR. EXISTING SEMI-INDUSTRIAL PLANT WILL BE AUGMENTED BY PEGAC CR PROCESS EQUIP. MFG PROCESS WILL BE FINALIZED. OPERATING PARAMETERS ESTABLISHED. AND A PROOF QTY OF CR PRODUCED.

(277) TITLE - TECHNOLOGY DATA BASE FOR FINACOLYL ALCOHOL

PROBLEM - FINACOLYL ALCOHOL IS NOT CURRENTLY AVAILABLE COMMERCIALLY IN PRODUCTION QUANTITIES AND THEREFORE, THE ARMY HAS NO AVAILABLE SUPPLY TO SUPPORT PRODUCTION OF HIGH PRIORITY EINAR IV CHEMICAL MUNITIONS.

SOLUTION - THIS PROJECT WILL ESTABLISH THE OPTIMUM CHEMICAL PROCESSES AND OPERATIONAL MODES FOR PRODUCTION OF FINACOLYL ALCOHOL AND DEVELOP A TECHNOLOGY DATA BASE FOR SCALE-UP TO COMMERCIAL LEVEL PRODUCTION FACILITIES.

(278) TITLE - PROCESS TECHNOLOGY FOR IR YM7. CHENARIC

PROBLEM - NO IR YM7 CHENARIC PROCESS TECHNOLOGY EXISTS.

SOLUTION - DEVELOP AND ESTABLISH TECHNOLOGY FOR CHENARIC IR.

FUNDING (\$000's)

PK10K F1 F2 F3 F4 F5

(CONTINUE)

360

305

315 370

490 500 1655 445

300 340

MMI FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	TITLE	FUNDING (\$000)	PRIORITY				
			E1	E2	E3	E4	E5
(0911) 1	AUTOMATED AGENT PERMEATION TESTER	197	224				
PROBLEM	MMI PROJECT 575 1314 DEVELOPED INSTRUMENTATION FOR AN IMPROVED PERMEATION TESTER. HOWEVER BECAUSE OF COST (\$5,000 FOR TEST UNIT) AN ANNIQUATED METHOD USING FRUIT FLIES IS STILL USED FOR MOST OF THESE TESTS.						
SOLUTION	A SYSTEM WILL BE DEVELOPED TO SEQUENTIALLY SAMPLE DATA FROM 10 TESTS AND FEED IT TO ONE TEST UNIT. SAMPLES OF ONE MINUTE EVERY TEN MINUTES WILL BE SUFFICIENT BECAUSE OF LONG TEST PERIODS (4 HOURS OR MORE). FLOW CONTROLS INCLUDE SOLENOID VALVES.						
(0912) 1	PRODUCTION PROCESS FOR PROTECTIVE MASK CANISTER BODIES	474					
PROBLEM	THE CURRENT FIVE-STEP LEAP-FRAW PROCESS IS TIME CONSUMING, THE PROCESS HARDENS THE MATERIAL AND MAKES IT SUBJECT TO CRACKING.						
SOLUTION	ESTABLISH A PROCESS WHEREBY THE CANISTERS WILL BE FORMED ON A PROTECTIVE DIE MACHINE.						
(0914) 1	AUTOMATIC FINISHING OF MASK COMPONENTS	761					
PROBLEM	DURING MASK MOULDING OPERATIONS, AN EXCESS OF MATERIAL (FLASH) REMAINS ON THE MOLDING PARTS.						
SOLUTION	DEVELOP TUMBLING IN A CYCLONIC ENVIRONMENT AS AN AUTOMATED PROCESS TO REMOVE FLASH.						
(1175) 1	PFG TECH FOR NEW PROTECTIVE MASK	2941	1848				
PROBLEM	FAIRCLOTH, OF ONE-PIECE PLASTIC MASKS WITH INADEQUATE OPTICAL CHARACTERISTICS IS DIFFICULT. VISUAL REDUCTION AND DISTORTION ARE CRITICAL.						
SOLUTION	DEVELOP MANUFACTURING PROCESSES TO ALLEVIATE PRODUCTION PROBLEMS DEFINED BY PEP EFFORT.						
COMPONENT	-- PROTECHNIC						
(1176) 1	ADAPTATION OF SLUGGING TECHNOLOGY TO HC SMOKE AND CS RIOT	150					
PROBLEM	CLAYEFUL SMOKE GRENADE SLUGGING CONCEPT IS NOT ADAPTED TO HC AND PIGMENT MIXTURES. CURRENT FILL AND PRESS OPERATIONS ARE LABOR INTENSIVE.						
SOLUTION	ADAPT SLUGGING TECHNOLOGY TO HC AND PIGMENT MIXTURES. IMPROVE INDUSTRIAL HYGIENE.						

PART FIVE YEAR PLAN
FCS DIRECT 126

FUNDING (\$GFC)

COMPONENT -- PYROTECHNICS

(CONTINUED)

(P015) TITLE - ACQUISITION OF SLICING CONVEYOR WITH SMOKE MARKER FDN

PROBLEM - SMOKE MARKER MUST BE FILLED TO CLOSE TOLERANCES. CURRENT FILL VEHICLES ARE INEFFECTIVE. LAP TIME COSTS ARE HIGH. MATERIAL HANDLING IS LABOR INTENSIVE.

SOLUTION - APPLY SLICING TECHNOLOGY FOR AUTOMATED PRODUCTION. REPLACE MANUAL WORK. HANDLING WITH MECHANICAL SYSTEMS.

(P016) TITLE - INSULATION OF PYROTECHNIC PRODUCTION LINES

PROBLEM - MULTI-PURPOSE LINES. SHIFT CAPACITY PRODUCTION RUNS.

SOLUTION - PROVIDE SIMULATION SOFTWARE. MONITOR PRODUCTION PROCESSES. PROVIDE STATE OF READINESS.

(P017) TITLE - INCENDIARY MIX STUDY

PROBLEM - TECHNOLOGY OUTDATED. FACILITIES OLD AND LABOR INTENSIVE. HEAVY POLLUTANT.

SOLUTION - FINANCIAL STUDY TO PROVIDE UPGRADED EQUIPMENT. PROVIDE STATE OF ART TECHNOLOGY. LIMIT POLLUTION FROM FLUAT.

(P018) TITLE - ADVANCED TECH FOR MANUFACTURE OF RED PHOSPHORUS

PROBLEM - THERE IS A HIGH TRAGEDY RISK FOR A FAMILY OF NEW SMOKE POWDERS. THE LEAD INGREDIENTS CONTAIN RED PHOSPHORUS AND THE 105MM AND 120MM SHELL CASINGS FOR IT. HOWEVER, RED PHOSPHORUS IS NOT PRODUCED IN THE USA.

SOLUTION - IS OBLIGED TO HAVE AN ALTERNATE PIBILIZATION SUPPLY OF RP. DEVELOP THE TECHNOLOGY REQUIRED TO DESIGN FOR PHOSPHORUS FACILITY.

(P019) TITLE - INFR PROCESSING OF STARTER WIRE FOR PYROTECHNIC MUNITIONS

PROBLEM - ACCIDENTAL IGNITION OF WIRE DURING PROCESSING IS A SERIOUS PERSONAL SAFETY CONCERN DUE TO EXPOSURE TO FIRE AND EXPLOSIVE HAZARDS.

SOLUTION - EVALUATE NEW MIXING AND HANDLING TECHNOLOGY THAT WILL MINIMIZE EXPOSURE TO SAFE AND TOXIC MATERIALS.

(P020) TITLE - BOTTLENECK PROCESS EQUIPMENT FOR 40MM CS, 1601

PROBLEM - CURRENT PRODUCTION FACILITIES EXIST ONLY IN PRIVATE INDUSTRY. THIS MUNITION WILL NOW BE PRODUCED IN OTHER FACILITY FOR WAR PURPOSES. CURRENT PROCESSING REQUIREMENTS ARE OBSOLETE STANDARDS.

SOLUTION - PLAN TO CONSTRUCT A FACILITY FOR PRODUCTION OF THE 40MM RED, YELLOW, AND GREEN COLORANT SMOKE WARFARE. THE TECHNOLOGY NEEDED TO CONVERT AND VERIFY THIS FACILITY TO INCLUDE PRODUCTION OF THE 40MM CS, 1601 CARTRIDGE IS TO BE DEVELOPED.

MMI FIVE YEAR PLAN
RCS DRCIT 126

FUNDING (\$000)

COMPONENT -- PYROTECHNICS (CONTINUE()

(41+1) TITLE - PYRO TECH FOR USE OF HI IN INFRA SMOKE MUN

PROBLEM - A REQUIREMENT EXISTS FOR APPLYING THE IMPROVED SMOKE CONCEPT TO
FILLING THE WARHEAD FOR THE 81 MM MORTAR.

SOLUTION - CONDUCT PROCESSING TECHNIQUE STUDIES FOR PREMIX, FILL, CLOSE AND
LAZY MINUTIAE PRODUCTION, PROCESS DATA.

(44+17) TITLE - USE OF RED PHOSPHORUS IN SMOKE POT APPLICATIONS

115 165
PROBLEM - SMOKE PRODUCED FROM HC HAS LED TO SOME INJURIES AND IS SUSPECTED OF
BEING A CARCINOGEN. R&D WORK IS BEING DONE TO DEVELOP A RED PHOSPHOROUS MIX
TO REPLACE HC. HOWEVER NO LARGE SCALE RF PREPARATION FACILITIES CURRENTLY
EXIST.

SOLUTION - DEVELOP THE TECHNOLOGY AND ESTABLISH A PROTOTYPE FACILITY WHICH
WILL ON A LARGE SCALE PREPARE FOR LEADING THE FF FORMULATION WHICH IS
DEVELOPED IN R&D

(45+4+) TITLE - SAFETY IMPROVEMENTS OF PYROTECHNIC MIXING

PROBLEM - PYROTECHNIC MIXING REQUIRES INCREASED PERSONNEL SAFETY FEATURES.

SOLUTION - EVALUATE CUPPLANT PROCESS AND INCREASE OPERATOR SAFETY THROUGH
ADAPTION OF PROCESS CHANGES.

* C A T E C O R Y *

* ENERGY CONSERVATION *

COMPONENT -- GENERAL

(27+16) TITLE - UTILIZATION OF HEAT GENERATED IN TNT MANUFACTURE

PROBLEM - NO EFFECTIVE USE IS BEING MADE OF THE HEAT REMOVED BY COOLING WATER
DURING THE MITIGATION STAGES IN THE MANUFACTURE OF TNT.

SOLUTION - INSTALL HEAT TRANSFER EQUIPMENT TO RECOVER THE HEAT GENERATED BY
THE MITIGATION REACTIONS FOR USE IN THE TNT PURIFICATION OPERATIONS.

(27+2+) TITLE - HEAT RECOVERY FROM CYCLOHEXANE VAPOR

PROBLEM - CRUDE RXN OF HMW IS DISSOLVED IN WATER/CYCLOHEXANONE SOLUTION & AID
OF STEAM HEAT. IT IS THEN RECRYSTAL TO OBTAIN UNTILTED CRYSTALLINE SIZE +
C.C. FIG. 17.17.17. CYCLOHEXANE-CYCLOHEXANE VAPOR CONDENSED BY COOLING
WATER PROCESS IS ENERGY INTENSIVE.

SOLUTION - THIS PROJ INVOLVES USE OF HEAT AVAIL FROM THE CYCLOHEXANE VAPOR
TO ACHIEVE DISSOLUTION OF THE KEPHAX CRYSTALS + THEREBY REDUCE THE
REQUIRMENT FOR STEAM.

PRIOR 61 82 83 84 85
FUNDING (\$000)

476

WEST FIVE YEAR PLAN
R&D BUDGET 126

FUNDING (\$1000)

PK104 E1 E2 E3 E4 E5

CONTINUED

(42.1) TITLE - PROBLEM AAPS BASED ON ENERGY CONCENTRATION

SOLUTION - RECAP - RECAP (RESCALED ENERGY COST ANALYSIS PROGRAM) TO ACCOUNT FOR THE UNIQUE DESIGN FEATURES OF AAPS.

SOLUTION - RECAP IS A PROGRAM FOR DETERMINING BUILDING DESIGN COST EFFECTIVENESS BASED ON ENERGY CONSIDERATIONS. MUST BE ADAPTED TO THE UNIQUE DESIGN FEATURES FOUND IN AAPS.

(42.4) TITLE - ALTERNATIVE AZOTOPIC SOLVENT FOR ACETIC ACID CONCENTRATION

PROBLEM - CURRENT ACETIC ACID CONCENTRATION PROCESS AT WSAAP USES N-METHYL ACETATE AS AN EXTRACTING AGENT TO REMOVE WATER FROM THE ACETIC ACID. THIS CURRENT PROCESS USES VERY LARGE CAPACITY OF ENERGY FOR THIS PROCESS.

SOLUTION - REPLACE THE N-METHYL ACETATE WITH N-BUTYL ACETATE. N-BUTYL ACETATE IS A MUCH MORE EFFICIENT AZOTOPIC AGENT THAN N-METHYL ACETATE.

(42.1) TITLE - CONSERVATION OF ENERGY AT RAPS

PROBLEM - FILTRATION MAY NOT BE AVAILABLE IN FUTURE TO MEET PRODUCTION REQUIREMENTS.

SOLUTION - DEVELOP ENERGY SAVING TECHNOLOGY TO APPLY TO RAPS MANUFACTURING FUNCTIONS TO REDUCE QUANTITY OF ENERGY USED AT ALL LEVELS OF PRODUCTION.

(44.1) TITLE - PYROLYSIS OF RAPS WASTE

PROBLEM - WASTE IS DESTROYED WITHOUT RECOVERY OF ENERGY.

SOLUTION - RECOVER ENERGY FROM WASTE.

CATALYST
EXOGENESES

CONTINUED

(46.7) TITLE - CONTINUOUS PROCESS FOR GEMULAR COMPOSITION

PROBLEM - THE BACHELOR COLLEGE PROCESS OF PREPARATION SLURRY ALLOWS ONLY A LIMITED CONTROL OF CONSISTENCY.

SOLUTION - DEVELOP AND USE A CONTINUOUS PROCESS TO PRODUCT GEMULAR CONSISTENCY.

MWT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	-- HMX/RDX	FUNDING (\$000)			
		P910K	81	82	83
(4444) TITLE	- IMPROVE RECOVERY OF ACETIC ACID IN RDX MANUFACTURING				
PROBLEM	- FORMIC ACID IN THE "A" AREA AEO STILL AT HSAP CAUSES PROBLEMS.	246	162		
FIRST THE STILL MUST BE MADE OF HASTALLOY VS STAINLESS AND SIDE REACTIONS					
CAUSE STEAM USAGE TO GO UP 140 PERCENT AND THE ENTRAINER TO BE REPLACED					
TWICE A YEAR.					
SOLUTION	- NEUTRALIZE THE FORMIC ACID PRIOR TO ITS INTRODUCTION TO THE AEOO				
SSTILL.					
(4446) TITLE	- IMPROVE YIELD OF HMX DURING RDX NITRULATION	633	642		
PROBLEM	- THE CURRENT MANUFACTURING PROCESS FOR HMX IS INEFFICIENT IN THAT				
YIELDS OBTAINED ARE STILL LESS THAN THEORETICAL.					
SOLUTION	- THE CURRENT BACHMANN PROCESS WILL BE MODIFIED TO INCREASE THE HMX				
YIELD BEYOND 50 PERCENT.					
(4449) TITLE	- PROCESS IMPROVEMENT FOR COMPOSITION C-4	97	339	520	
PROBLEM	- THE EXISTING FACILITIES WHICH ARE COMMON TO THE MANUFACTURE OF COMP				
H AND THE OTHER RDX COMPOSITION WOULD LIMIT THE AVAILABILITY OF THESE ITEMS					
BELLOW THEIR MOB REQUIREMENTS.					
SOLUTION	- ESTABLISH NEW PROCESSES AND METHODS FOR THE MANUFACTURE OF THESE				
ITEMS TO VIMIZE THE IMPACT OF COMMON OPERATIONS ON CAPACITY.					
(4515) TITLE	- HXAMINE MANUFACTURING AND SOLUTION PREPARATION				
PROBLEM	- THERE IS INSUFFICIENT SUPPLY OF HEXAMINE TO PRODUCE RDX AND HMX				
MOBILIZATION REQUIREMENTS. MUCH OF THE TECHNOLOGY IS AVAILABLE TO PERMIT					
MANUFACTURE ON-SITE. THE PREPARATION OF AN ACETIC ACID-HEXAMINE SOLUTION					
FROM AGEOUS HXAMINE REQUIRES STUDY.					
SOLUTION	- VERIFY DISTILLATION ASSUMPTIONS ON BENCH SCALE PRIOR TO PROCEEDING				
WITH FULL-SCALE DESIGN.					
(4525) TITLE	- PRODUCTION OF HMX FROM A MODIFIED RDX PROCESS				
PROBLEM	- HMX IS CURRENTLY BEING PRODUCED AT A RATE OF 1/4 OF RDX. THIS HAS				
CONTRIBUTED TO THE HIGH PRODUCTION COST OF HMX.					
SOLUTION	- MODIFIED A CONTINUOUS HX REACTOR AND VARY THE REACTION PARAMETERS				
TO PRODUCE HMX AT A MUCH EXPANDED PRODUCTION RATE (AT LEAST TWO TO					
FOURFOLD).					

MNT FIVE YEAR PLAN
RCS FRCT 126

2.04.6.1 -- PROCESS CONTROL

(15-5) TITLE - H-10 CONTINUOUS CAST FOR MUNITION LOADING

PROBLEM - LIMITED USE OF CASTABLE PLASTIC BONDED EXPLOSIVES WILL CREATE PRODUCTION SHORTFALLS. MOST PBX CAN NOT BE USED IN PRESENT MELT / CAST EQUIPMENT. PBX PRODUCTION IS NOW DONE AT 2 NAVY PLANTS WHICH COULD NOT HANDLE LOADING OF CASTABLE PBX IN BOMBS.

SOLUTION - ESTABLISH HIGH PRODUCTION RATE CONTINUOUS PROCESSES FOR MIX AND CAST OF VARIOUS PBX FORMULATIONS. IDENTIFY + EVALUATE EQUIPMENT + PROCESSES. SELECT + TEST EQUIPMENT + INTEGRATE ACCEPTABLE ITEMS INTO AN OPERATING PBX PROCESSING PILOT PLANT.

(37-6) TITLE - PROCESS FOR MANUFACTURE OF ETHYLENE DIAMINE LINITRATE (EDAN)

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

COMPONENT -- T-6

(16-6) TITLE - EVAL INDUST CAPABILITY FOR COMMERCIAL EXPL-HIGH USE MUNIT

PROBLEM - DURING MOBILIZATION THERE CAN BE A SHORT FALL IN AVAILABILITY OF MILITARY EXPLOSIVES. INDUSTRY HAS MANY STAFF EXPLOSIVE FORMULATIONS. THEIR APPLICABILITY TO MILITARY USE IS UNKNOWN. INDUSTRIAL CAPABILITY FOR MILITARY FILLING THESE EXPL IS UNKNOWN.

SOLUTION - CONSTRUCT A PROGRAM TO IDENTIFY THE QUANTITIES AND TYPES OF COMMERCIALLY AVAILABLE EXPLOSIVES THAT COULD BE USED TO SUPPLEMENT THE ARMY'S PRODUCTION CAPABILITIES DURING EMERGENCY PRODUCTION PERIODS. EVALUATE THE EFFECTIVENESS OF MUNITION'S PRODUCED THIS WAY

(42-6) TITLE - TNT CRYSTALLIZER FOR LARGE CALIBERS

PROBLEM - TNT MELT LOADING REQUIRES AN OPTIMUM RATIO OF MOLTEN AND SOLID TNT. THE EXPLOSIVE SET AT THE TIME OF FUSION. THE RATIO IS OBTAINED BY THE ADDITION OF FLAKES AND TO A QUANTITY OF MOLTEN TNT BASED ON OPERATOR JUDGEMENT.

SOLUTION - DEV A DEVICE WHICH UTILIZES MOLTEN TNT TO GEN A SLURRY CONSISTENCY THROUGH PARTIAL CRYSTALLIZATION. STATION-STATE CRYSTALLIZATION. BY CLOSE CONTROL OF TNT FLOW RATE AND THERMAL PASTURE THERM. A CONTINUOUS FINE GRAINED SLURRY MIX OF FUSION RATIO WOULD RESULT.

(44-6) TITLE - CONTINUOUS TNT PROCESS FOR THERMITE

PROBLEM - INCONSISTENT PRODUCT PROCESS. RESTRUCTURE PROCESS AND SAFETY IMPROVEMENTS.

SOLUTION - IN VOC. AND BUILD A CIL LINE TO TEST PROCESS IMPROVEMENTS.

	TITLE	PRIOR	FUNDING (\$000)			
			E1	F2	F3	E4
15-5	H-10 CONTINUOUS CAST FOR MUNITION LOADING	250				1065
37-6	EVAL INDUST CAPABILITY FOR COMMERCIAL EXPL-HIGH USE MUNIT	300				550
42-6	TNT CRYSTALLIZER FOR LARGE CALIBERS	29				488
44-6	CONTINUOUS TNT PROCESS FOR THERMITE	400				2486

NMI FIVE YEAR PLAN
RQS DRCMT 126

COMPONENT --	TITLE	PROBLEM	SOLUTION	(CONTINUED)				FUNDING (\$000)
				PRIOR	A1	82	83	
TNT	(4349) TITLE - INSTRU IN-PROCESS MEASUREMENTS OF SOLID LIQUID TNT	PROBLEM - NO ACCURATE REAL TIME CAPABILITY EXISTS TO MEASURE THE SOLID/LIQUID RATIO OF TNT SLURRIES CRITICAL FOR TNT LOADING OF MEDIUM AND LARGE CALIBER PROJECTILES. THIS RESULTS IN MAFICINAL PROCESS CONTROL WITH A POTENTIAL FOR DEFECTIVE CASTS AND REWORK.	SOLUTION - DEVELOP REMOTELY OPERATED HIGHLY SENSITIVE INSTRUMENTATION TO MEASURE SLURRY SOLID/LIQUID PROPORTION DURING TNT LOADING OPERATIONS. THIS WILL PERMIT CLOSE CONTROL OF THE TNT PHYSICAL CHARACTERISTICS AND RESULT IN THE HIGHEST UNIFORM QUALITY POSSIBLE	158	163	277	561	385
	(4452) TITLE - REPROCESSING DEMILLED EXPLOSIVES	PROBLEM - LARGE QUANTITIES OF EXPLOSIVES FROM DEMILITARIZATION ARE DESTROYED ANNUALLY. PRIMARILY BY BURNING BECAUSE NO ESTABLISHED METHOD IS AVAILABLE FOR REPROCESSING THE MATERIAL FOR REUSE IN MUNITIONS LOADING.	SOLUTION - DEVELOP PROTOTYPE EQUIPMENT FOR REPROCESSING/REFINING RECLAIMED EXPLOSIVES. ANALYZE THE QUALITY, ENERGY POTENTIAL, AND LOADING RESULTS OF P RECLAIMED EXPLOSIVES USED ALONE OR AS A MIXTURE WITH VIRGIN MATERIAL.	277	561	385	141	200
	(4527) TITLE - AUTOMATED FLAKER MOLTEN TNT DETECTOR	PROBLEM - WHEN TNT DOES NOT SOLIDIY ON FLAKER DRUM IT FALLS INTO HOPPER WHERE IT SOLIDIFIES AND STOPS THE FLOW OF TNT FLAKES. OPERATIONS MUST BE STOPPED UNTIL THE HAZARDOUS REMOVAL OF TNT FROM HOPPER BY PEAMING OR RAPPING IS COMPLETED.	SOLUTION - A MOLTEN TNT DETECTOR WILL BE DEVELOPED TO DETECT PRESENCE OF MOLTEN TNT ON FLAKER DRUM AND STOP THE FLAKING OPERATION. THIS WILL PREVENT MOLTEN TNT FROM ENTERING THE HOPPER.	*****	*****	*****	*****	*****
ELECTRONICS	(L212) TITLE - FOPEN SIGHTING OF SFF W/D L/AIR SENSOR	PROBLEM - NO PRODUCTION PROCESS EXISTS TO EJECT SIGHT STORM WARHEAD TO IR SENSOR. PRESENT HAND PROCESS REQUIRES SEVERAL HOURS AND IS UNRELIABLE.	SOLUTION - DEVELOP EQUIPMENT TO AUTOMATE PROCESS.	* C A T E G O R Y *	* FUZFS	* FUZFS	* FUZFS	200

COMPONENT	-- ELECTRICALS	(CONTINUE?)	FUNDING (\$000)				
			FY10K	F1	F2	F3	F4
(3716) TITLE	- SENSOR TECHNOLOGY		1000				
PROBLEM	- REPLACE CONVENTIONAL (ANI COMPLEX) FUZES WITH OPTICAL SENSING DEVICES.						
SOLUTION	- THIS TECHNOLOGY (SENSECO) WILL BE HIGHLY AUTOMATED IN PRODUCTION AND HIGHLY ACCURATE IN USE. (COMMERCIAL APPLICATIONS WILL BE NUMEROUS IN THIS TIME SPAN).						
COMPONENT	-- LAF						
(4521) TITLE	- #00 M223 FUZE PACK OUT		800				
PROBLEM	- M&I PROJ CURRENTLY UNDER CONTRACT TO AUTO ASSEMBLE M223 FUZE AT MAXIMUM RATE OF 50 ASSEMBLIES PER MINUTE. MANUAL PACKOUT OF M223 FUZES INTO SHIP + STORAGE CONTAINERS AT HIGH FOG RATE WOULD BE A HIGH LABOR INTENSIVE OPP. UP TO 500 ASSEMBLIES PER MINUTE						
SOLUTION	- DEVELOP AN AUTOMATED PACK OUT LINE TO MATE WITH THE AUTOMATIC ASSEMBLY EQUIPMENT.						
COMPONENT	-- METAL PARTS						
(2775) TITLE	- POWDER METALLURGY FUZE COMPONENTS		1000	170			
PROBLEM	- MACHINING FUZE METAL PARTS FROM BAR STOCK IS TIME CONSUMING + GENERATES A LARGE AMOUNT OF SCRAP. THERE IS A NEED TO DEV ALTERNATE PROCESSES FOR FABRICATING FUZE PARTS THAT ARE MACHINED FROM BAR STOCK.						
SOLUTION	- DEVELOP ALTERNATE PROCESSES FOR FABRICATING FUZE PARTS THAT ARE MACHINED FROM BAR STOCK.						
COMPONENT	- CHEMICAL MACHINING OF PRECISION COMPONENTS						
PROBLEM	- HOLDING TOLERANCES AND HIGH SCRAP RATES ARE COMMON PROBLEMS WHEN SMALL THIN FUZE PARTS ARE STAMPED IN A PRESS. STAMPING IS CAPITAL INTENSIVE AND IS ONLY GOOD FOR VERY HIGH VOLUME QUANTITIES.						
SOLUTION	- CHEMICAL MACHINING OF COMPONENTS REQUIRES LESS CAPITAL EQUIPMENT AND PRODUCES A MUCH SMALLER QUANTITY OF SCRAP.						
COMPONENT	- HOT FORMING + COLD HEADING LARGE FUZE COMPONENTS						
PROBLEM	- MULTISPINDLE BAR MACHINES DATE FROM 1960'S. THEY HAVE LOW PRODUCTIVITY. UC YC1 MEET OSHA. CAN'T USE CARBIDE TOOLS. NO SPARE PARTS.						
SOLUTION	- APP. Y MOD TECH SUCH AS HOT FORGE AND COLD HEADING TO OBTAIN SHAPE REDUCE MACHINING AND SCRAP. THIS ALLOWS HIGH SPEED CHUCKERS FOR FINISH MACHINING.						

HMT FIVE YEAR PLAN
RCS DRCMT 126

COMPONENT --	TITLE	PROBLEM	FUNDING (\$000)				
			PRIOR	81	82	83	84
(CONTINUED)							
(4462) TITLE - HSS PRECISION GEAR HOBS	PROBLEM - THE FUZE PRODUCTION BASE UTILIZES SOLID CARBIDE HOBS FOR MFG. PINIONS. THERE IS NO DOMESTIC MFR OF THESE HOB. THEY ARE IMPORTED FROM FOREIGN SOURCES. LEAD TIME IS 11 TO 18 WEEKS. A SURVEY SHOWED A LACK OF TECH. SKILLS + INTEREST IN MFG.	SOLUTION - DEVELOP IMPROVED HIGH SPEED STEEL HOBS USING HIGH STRENGTH STEEL TO IMPROVE WEAR LIFE AND PROVIDE A BACKUP FOR MOB AND LEADTIME RED UCTION USING U.S. AVAILABLE TECHNOLOGY.	447	1000			
(4434) TITLE - MFG, TEST, AND INSP EQPT F/XM763, 105MM FUZE							
COMPONENT -- METAL PARTS	PROBLEM - NO PROBLEM PROVIDED.	SOLUTION - NO SOLUTION PROVIDED.	450	475			
(1001) TITLE - PILOT LINE FOR FUZE FLUIDIC POWER SUPPLIES							
COMPONENT -- POWER SUPPLIES	PROBLEM - FLUIDIC GENERATORS ARE COMPLEX AND COSTLY TO PRODUCE. IN PRODUCTION, CLOSE TOLERANCES AND SMALL PART ASSEMBLY ARE REFLECTED IN HIGH COST AND LOW YIELD.	SOLUTION - IDENTIFY AND ADOPT THE MOST ECONOMICAL MFG PROCESSES AND TECHNIQUES TO ESTABLISH A MECHANIZED PILOT LINE FOR ASSEMBLY OF FLUIDIC POWER SUPPLIES.	253	315			
(4245) TITLE - MANUFACTURING, INSPECTION AND TEST EQUIP FOR MAG PWR SUPPLY							
COMPONENT -- GA/TESTING	PROBLEM - PIEZOELECTRIC POWER SUPPLIES USED IN HEAT AMMO HAVE UNDESIRABLE VOLTAGE GENERATION IMPRESSED ON THE ELECTRICAL CIRCUITS OF THE ROUND DUE TO SHOCK VIBRATIONS RESULTING DURING FLIGHT WHICH MAY CAUSE PREMATURES.	SOLUTION - MOVE THE POWER SUPPLY FROM THE NOSE OF THE ROUND TO INSIDE THE PILO FUZE HOUSING AND CHANGE IT TO A MAGNETIC PULSE GENERATING TYPE POWER SUPPLY WHICH IS UNAFFECTED BY THE PROFILE OF SHOCK VIBRATIONS.	345	759			
(0024) TITLE - IN PROCESS INSPECTION OF ENCAPSULANT MATERIAL							
COMPONENT --	PROBLEM - PROCESS TECHNOLOGY FOR PLASTIC ENCAPSULANTS WAS DEVELOPED UNDER S 78 3907 HOWEVER INSPECTION TECHNIQUES FOR THOSE ENCAPSULANTS WERE NOT DEVELOPED	SOLUTION - DEVELOP A NON DESTRUCTIVE INSPECTION TECHNIQUE TO DETERMINE IF VOIDS EXIST IN THE MATERIAL. THIS WILL INCREASE YIELDS AS WELL AS PROVIDE 100% INSPECTION CAPABILITY.	300				

NOT FINI VIBAR PLAN
RCS PRECAST 126

COMPONENT	-- TEST	TESTING	QUANTITY				FUNDING (\$RC\$)			
			F1	F2	F3	F4	F5			
(C7c) TITLE - TEST FOPT AND PROCESSES FOR XM762 ELECTRONIC FUZE	CONTINUOUS									
PROBLEM - THERE IS A NEED FOR THE EQUIPMENT AND PROCESSES THAT CAN FAVORIT PRODUCTION TESTING OF FUZE ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.										400
SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP TESTING APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION TESTING OF FUZE COMPONENTS AND ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.										
(C8c) TITLE - IMPROVE 43-D VIBRATION ACCEPT TEST FM722 M724			62	252						
PROBLEM - CURRENT METHODS ARE COSTLY AND TIME CONSUMING. RARELY EXPOSE THE TEST ITEM TO TRUE SERVICE ENVIRONMENTS. AND REQUIRE THREE TESTS TO ACCOUNT FOR ALL TEST AXES.										
SOLUTION - USE OF COMPUTERIZED 3-D VIBRATION / SHOCK TESTING AS AN ACCEPTANCE TOOL SOLVES TECHNICAL + ECONOMIC TEST DEFICIENCIES. TEST TIME IS REDUCED										
(4.3f) TITLE - HIGH SPEED DIMENSIONAL INSP OF FUZE COMP										200
PROBLEM - FUZE PRECISION PLATES ARE INFECTED BY SAMPLING AND MANUAL METHODS.										
SOLUTION - PROVIDE 100 PERCENT HIGH SPEED AUTOMATED INSPECTION PRODUCTION. TRENDS CAN BE RECORDED FOR PROCESS CONTROL.										
***** * C A T F C O R Y * ***** * G E N E R A L * *****										
COMPONENT -- MISCELLANEOUS										
(L2c) TITLE - INSPI + TEST FUZE FOR CONDUCTIVE MIX DETONATOR										
PROBLEM - CONDUCTIVE MIX TYPE DETONATORS HAVE NOT BEEN FABRICATED IN PRODUCTION QUANTITIES.										650
SOLUTION - A US VERSION OF THE GERMAN CONDUCTIVE MIX DETONATOR WILL BE FABRICATED USING THE LATEST TECHNOLOGIES. THE PROJECT WILL PROVIDE THE MECHANIZATION NEEDED FOR INCREASED SAFETY AS WELL AS INCREASED PRODUCTION AT A LOWER COST.										
(L2c) TITLE - FOAM IN PLACE MUNITION FURY FM44										
PROBLEM - DEVELOP PROCESS TO ENCAPSULATE MAJOR MUNITION COMPONENTS WHERE INTERNAL STRESSES WOULD BE MINIMIZED. ALIGNMENT OF ELEMENTS WOULD NOT BE DISTURBED AND EXPLOSIVES WOULD BE COMPATIBLE WITH EXPLOSIVES AND OTHER SENSITIVE COMPONENTS.										100
SOLUTION - DETERMINE OPTIMUM COMBINATION OF FOAM INPLACE MATERIALS AND COMPONENT ALIGNMENT PROCESS TO ALLOW FOR ENCAPSULATION OF INTERNAL COMPONENTS FOR XM44.										120

MMT FIVE YEAR PLAN
RCS DRMT 126

COMPONENT -- MISCELLANEOUS	(CONTINUED)	FUNDING (\$000)				
		PRIOR	'81	'82	'83	'84
(2742) TITLE - LASER APPLIED DURABLE COATINGS			150	200		
PROBLEM - PRODUCTIVITY IS A FUNCTION OF RAM TO INCREASE RELIABILITY AND REDUCE MAINTENANCE DOWNTIME AND COST IN THE MUNITIONS PLANT ENVIRONMENT IS VERY DIFFICULT.						
SOLUTION - UTILIZE LASER APPLIED CURABLE COATINGS ON MACHINE AND TOOL WEAR SURFACES AND IN CORROSIVE ENVIRONMENTS.						
(4359) TITLE - PROCESS DEVEL F/120MM AMMO		4622	3951	2960		
PROBLEM - MASS PRODUCTION IN THE LS OF W. GERMAN 120MM TANK AMMUNITION POSES PROBLEMS IN FOUR FUNCTIONAL AREAS - METAL PARTS, PROPELLANT, FUZE, AND LAP.						
SOLUTION - THIS IS A MULTI-YEAR EFFORT IN FOUR FUNCTIONAL AREAS. A SEPARATE TASK ADDRESSES EACH UNIQUE PROFILE. THIS MMT SUPPORTS FACILITY PROJECTS IN FY83-84 AND IS ESSENTIAL TO FIELDING THE 120MM GUN SYSTEM ON THE XM1 TANK IN FY85.						
(6736) TITLE - TECH READINESS ACCEL THRU COMBINE INTEGRATED MFG (TRACIM)			871			
PROBLEM - THE LEAD TIME REQUIRED TO BRING PRODUCTION LINES TO MOBILIZATION MAXIMUM IS INTOLERABLY EXCESSIVE. A CRITICAL DETERRENT IS THE EXTREME SHORTAGE OF TOOLMAKERS AND MACHINISTS.						
SOLUTION - THE DEVELOPMENT AND IMPLEMENTATION OF A COMPUTER INTEGRATED MANUFACTURING SYSTEM WILL SIGNIFICANTLY REDUCE THE REQUIREMENT FOR HIGHLY SKILLED CRAFTSMEN.						
***** * C A T E G O R Y * *-----* *LAP* *****						
COMPONENT -- ASSEMBLY						
(D070) TITLE - LAP OF SENSE AND DESTROY ARMOR (SADARM)						950
PROBLEM - SADARM COMPONENTS ARE COSTLY TO LAP. NO ECONOMICAL PRODUCTION SYSTEM EXISTS.						
SOLUTION - DEVELOP ECONOMICAL METHODS FOR LAP OF SADARM COMPONENTS.						
(2700) TITLE - LAP CENTER CORE PROPEL-LING CHARGES						150
PROBLEM - TACK SEWING END SEAMS OF RAISE IGNITER ASSEMBLY + BODY ASSEMBLY REQUIRES NEW SEW MACHINE APPROACH/TECHNIQUE. THIS IS REQUIRED TO REDUCE COSTS BY REDUCING NUMBER OF PERSONNEL NEEDED TO PERFORM SEWING OPERATIONS.						
SOLUTION - EVALUATE CURRENT STATE-OF-THE-ART SEWING MACHINE TECHNIQUES TO INCORPORATE A METHOD COMPATIBLE WITH AUTOMATED LAP EQUIPMENT. BUILD A MOCK-UP OF THE SEWING STATION.						

MMT FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	TITLE	PROBLEMS	SOLUTION	FUNDING (\$000)			
				PRIOR	61	62	63
(CONTINUED)							
(2716) TITLE - AUTOMATIC PROCESSING OF PARACHUTE ASSEMBLIES	PROBLEM - PARACHUTE ASSEMBLY AT PRESENT IS AN OPERATOR CONTROLLED PROCESS DEVELOPED FROM HAND FOLDING OF MANUFACTURED PARACHUTES. THIS IS A TIME CONSUMING AND COSTLY PROCESS REQUIRING EXPERIENCE AND DEXTEROUS PERSONNEL.	SOLUTION - UTILIZING FAVORABLE RESULTS OF PRIOR YEAR FEASIBILITY STUDIES, BUILD AND TEST A FULL SCALE PROTOTYPE SYSTEM FOR ECONOMICALLY, RELIABLE, HIGH-RATE, SEMI-AUTOMATIC ASSEMBLY OF PARACHUTE COMPONENTS FOR AMMUNITION ITEMS.	700	85	84	83	82
(2710) TITLE - MODIFICATION OF LINE F/LAF OF UK PROPELLING CHARGE	PROBLEM - HAND LINE LOADING ASSEMBLY OF UK CHARGE WHEN ADOPTED WOULD BE REQUIRED WITH THE RESULTING HIGH COST, GREATER EXPOSURE OF PERSONNEL TO FLAMMABLE EXPLOSIVE MATERIALS AND LESS RELIABLE PRODUCT.	SOLUTION - DEVELOP TIG WELDING/EQUIPMENT MODIFICATION, REQUIREMENTS FOR AUTOMATICALLY LOADING/ASSEMBLING UK CHARGE ON THE AUTOMATED LAP LINE FOR US M214/M205 PROPELLING CHARGE.	170	700	6712	664	664
(2711) TITLE - CLOSURE/SEALING TECH FOR XM131/XM132 DISPENSER	PROBLEM - THE HOT GAS WELD TECHNIQUE USED TO SEAL THE MOPHS DISPENSER COVERS IS TIME CONSUMING AND ITS QUALITY IS HIGHLY DEPENDENT ON OPERATOR SKILLS.	SOLUTION - ALT SEALING/CLOSURE TECH SUCH AS ULTRASONIC WELDING, INDUCTION WELDING, HOT WIRE WELDING WILL BE INVESTIGATED. SEALING/CLOSURE EQUIP WILL BE DESIGNED TO MECHANIZE OR AUTOMATE CLOSURE + SEALING OPS.	900	1101	1101	1101	1101
(3011) TITLE - AUTO ASSY OF M21 FLASH SIMULATOR	PROBLEM - ITEM IS BEING MANUFACTURED IN WEST GERMANY F/AUS. CURRENT PLAN FOR PROCUREMENT IN US WOULD RESULT IN LABOR INTENSIVE OPERATION CURRENTLY PLANNED F/LONGHORN AAF.	SOLUTION - THE MMT WILL PROVIDE FA AUTOMATED ASSEMBLY LINE WHICH WILL REDUCE THE LABOR REQUIRED FOR ITEM PRODUCTION.	900	900	900	900	900
(4000) TITLE - AUTO MSS DETONATOR PRODUCTION EQUIPMENT	PROBLEM - LAP OF DETONATORS IS LABOR INTENSIVE. PERSONNEL EXPOSURE IS EXTENSIVE. MOP RATES ARE EXTREMELY HIGH.	SOLUTION - DEVELOP AN AUTOMATED SYSTEM FOR PRODUCTION OF NON-ELECTRIC DETONATORS TO PRODUCE HIGH QUALITY DETONATORS WITH REDUCED COST AND IMPROVED SAFETY.	6712	664	664	664	664
(4662) TITLE - AUTO MFG SUPPORT FOR MORTAR INCHIMENT CONTAINERS	PROBLEM - THE MANUFACTURE AND ACQUISITION OF THIS 60MM PROP CHARGE INCREMENT CONTAINER IS LABOR INTENSIVE. ENDS NOT WELL PROTECTION REQUIREMENTS.	SOLUTION - DEVELOP PROCESS AND EQUIPMENT TO REDUCE COSTS, INCREASE PRODUCTION RATES, AND IMPROVE QUALITY.	1391	1601	1601	1601	1601

HMT FIVE YEAR PLAN
RCS DRCMT 126

COMPONENT -- ASSEMBLY	(CONTINUED)	TITLE	FUNDING (\$000)				
			PRIOR	'81	'82	'83	'84
(415e) TITLE - EQUIPMENT FOR AUTO PROCESSING OF ADDITIVE LINER							
PROBLEM - PIP IS BEING EXECUTED TO ELIMINATE THE SEWING OF THE PROTECTIVE FILM TO ADDITION LINERS. ANOTHER TASK IS THE DEV OF AN ABLATIVE TYPE WEAR REDUCER (SILICON GREASE BAGGED IN MYLAR FILM). MFG EQUIP IS REQUIRED FOR EITHER GUN TUBE WEAR REDUCER.	371						
SOLUTION - AUTOMATED EQUIPMENT WILL BE DEVELOPED IN THE CASE OF SEWING ELIMINATION OF THE MYLAR FILM. AUTOMATED EQUIPMENT WILL BE DEVELOPED FOR METERING AND PACKAGING THE NEW ABLATIVE TYPE GUN TUBE WEAR REDUCER.							
(419e) TITLE - AUTOMATED LAP OF STICK-PROPELLANT CHARGES	1030						
PROBLEM - STICK PROPELLANT CHARGES HAVE NO LAP PROCESSING PRECEDENT. CURRENT MANUAL METHODS OF PRODUCTION ARE INEFFECTIVE IN ACHIEVING SATISFACTORY LEVELS OF QUALITY, COST, SAFETY AND PRODUCTION REALNESS.							
SOLUTION - EFFICIENT HIGH SPEED AUTO LAP EQUIPMENT WILL BRING PRODUCTION OF STICK PROPELLANT CHARGES TO A LEVEL CONSISTENT WITH MODERN TECHNOLOGY. AN INITIAL ENGINEERING STUDY TO DEFINE CONCEPTS AND PARAMETERS TO BE FOLLOWED BY PROTOTYPE EQUIPMENT IS PROPOSED.							
(4311) TITLE - AUTO FROG EQUIF FOR XM 692 MINE DISPENSING SYSTEM	2683	460					
PROBLEM - PRESENT PRODUCTION FACILITY TO LAP THE XM692 MINE DISPENSING SYSTEM IS LIMITED TO A MANUAL/MANUAL ASSIST OPERATION WITH ATTENDANT PRODUCTION UNIT COSTS AND HIGH PERSONNEL EXPOSURE.							
SOLUTION - PROJECT WILL PROVIDE EQUIPMENT DESIGNS AND PROTOTYPE EQUIPMENT TO AUTOMATICALLY LOAD AND ASSEMBLE THE XM67 MINE, THEREBY REDUCING PERSONNEL HAZARDS AND PRODUCTION COSTS WHILE PROVIDING A MORE UNIFORM AND RELIABLE ITEM.							
(433e) TITLE - REV AUTOMATED EGFT FOR SEALING MSS DETONATORS	716						
PROBLEM - CURR MSS DETS ARE BEING LACQUERED. 2 APPROACHES TO SEALING ARE BEING INVEST. 1 USED FOIL PRECIATED W/ADHESIVE • THE OTHER WELDS THE DET CUF TO FOIL. BOTH CAN BE PERFD ON A LOAD-FREE HANDLING WILL REDUCE COST OF DET.							
SOLUTION - DEVELOP EQUIPMENT BASIC ON EITHER THE HOT MELL ADHESIVE OR ULTRA SONIC WELDING TECHNIQUE CURRENTLY BEING INVESTIGATED. RETROFIT BOTH SINGLE-FOUL AND MULTI-TOOL DETONATOR LOADERS WITH EQUIPMENT TO SEAL THE MSS DETONATOR.							
(434e) TITLE - MATCH OF ASSY OPERATION OF CRIMPER/CORFLON LINERS	540						
PROBLEM - CURRENT TECHNIQUES TO ASSEMBLE THE CRIMP LINER ASSEMBLY TO THE GUN TUBE REQUIRE LENGTHS OF OFF-CUTS. HANDLING HIGHLY HAZARDOUS FLACK FOIL.							
SOLUTION - THIS PROJECT WILL DEVELOP EQUIPMENT TO MECHANICALLY ASSEMBLE THIS CRIMPER ASSEMBLY. THIS WILL ENSURE THAT REDUCTION OF PERSONNEL IN HAZARDOUS OPERATIONS.							

MAT FIVE YEAR PLAN
RCS CRCP 126

COMPONENT -- ASSEMBLY	(CONTINUED)	FUNDING (\$000)			
		PRIOR	P1	P2	P3
(451) TITLE - ADHESIVE BOND OF IGNITER AND FLASH RELEASER BAGS OR COMPONENT ENCLOSURES	PROBLEM - PIP NO 1-82-09-7715 WILL PROVIDE AN ALTERNATE TO SEWING CLOTH BAGS.	565	723		
	SOLUTION - DEVELOP PRODUCTION EQUIPMENT TO APPLY ADHESIVE AND PROVIDE A QUALITY CLOTH-TO-CLOTH BOND.				
(4513) TITLE - AUTOMATIC GRENADE DECARTONIZING	PROBLEM - M42/M46 GRENADES ARRIVE IN BOXES ON BANDED PALLETS. THE PALLET, AND DE-BANDED AND BOXES REMOVED, OPENED, AND DISTRIBUTED TO THREE UNPACKING STATIONS. GRENADES ARE REMOVED FROM THE BOXES AND PUT ON THE CONVEYORS. AN OPERATOR DISCARDS THE EMPTY BOXES.	175			
	SOLUTION - AUTOMATE THE OPERATION FROM OPENING TO PLACEMENT OF THE GRENADES ON THREE CONVEYORS. ECFS WILL BE OPENED AND GRENADES REMOVED. THE M42/M46 WILL BE PLACED ON CONVEYORS. THE STATION WILL HAVE TO HANDLE BOTH M42/M46 AT THE RATE OF 300/MINUTE.				
(4513) TITLE - RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES	PROBLEM - PRESENT MOISTURE ANALYSIS TECHNIQUE REQUIRES SOME 3 3/4 HOURS FOR SAMPLE. IN AN AUTOMATED BACKLINE, THIS IS TOO LONG A PERIOD TO WAIT RELATIVE TO AN ACCEPTANCE/REJECTION DECISION FOR THE BATCH.				
	SOLUTION - INVESTIGATE THREE KNOWN TECHNIQUES FOR RAPID MOISTURE ANALYSIS AND PRACTICE WITH THE OPTIMUM TO THE PROTOTYPE STAGE.				
(4516) TITLE - PRESS LOADING PLU-63 BOMELTS & ACM MUNITIONS	PROBLEM - CAST LOADING PROCESSES FOR BOMELTS RESULT IN EXCESSIVE LOADING COSTS BECAUSE DOUBLE TO TRIPLE THE AMOUNT OF EXPLOSIVE IS NEEDED TO PROVIDE INTEGRITY.	265	115		
	SOLUTION - PRESS LOADING CAN BE USED WITH EXISTING LOADING EQUIPMENT. SMALL QUANTITY ITEMS CAN BE PACKED OFF WITH A SUPPORT FIXTURE TO WITHSTAND THE HIGH COMPACTING PRESSURES. STATIC FIRING TESTS OF LIVE MUNITION ITEMS WILL BE MADE TO CHECK OUT PERFORMANCE.				

MAT FIVE YEAR PLAN
FCS ORCPT 126

FUNDING (\$000)

COMPONENT -- GENERAL

(4271) TITLE - IMPROVE CONTROLS AND SEWING OF 2-D SIZING SYSTEM

PROBLEM - LUCKSTITCH SEWING REG & FREQUENT SHUTDOWN. OF EQUIP TO CHANGE BOBBINS.
DEFICIENT + OBSOLETE CONTROL SYS CAUSES FREQUENT TIME. INADEQUATE CONTROL OF
CLOTH MOVEMENT RESULTS IN SUBSTANTIAL NUMBERS OF OUT-OF-TOLERANCE RAGS.

SOLUTION - PROVIDE FOR AUTOMATIC SCRATCH REWINDING AND INSERTION. REPLACE
CONTROL SYSTEM. REPLACE PRESENT CLOTH FEED. TENSION CONTROL AND EDGE CONTROL
SYSTEMS.

(4281) TITLE - AUTO MANU OF DELAY FOR M649 AND XM650 PROJECTILES

PROBLEM - CURRENT OPERATION ARE LABOR INTENSIVE. COST OF ITEM IS HIGH.

SOLUTION - DEV AUTO LAP EQUIP.

(4522) TITLE - AUTO CARRIER CLEANING STATION FOR DET FAC

PROBLEM - CARRIERS USED IN PRODUCTION MAY HAVE CONSIDERABLE POWDER ON THEM
WHICH MUST BE REMOVED IN A SAFE MANNER. THE CURRENT MANUAL OPERATION IS
POTENTIALLY HAZARDOUS.

SOLUTION - DEVELOP AN AUTOMATIC FLASH REMOVAL AND CLEANING STATION FOR THE
AUTOMATED CONVEYOR SYSTEM AT THE LSAAF MODERNIZED RETONATOR FACILITY.

(4550) TITLE - AUTO ASSY OF M22 FLASH SIMULATOR

PROBLEM - ITEM MANUFACTURED IN TEST QUANTITIES ONLY. PLANS ARE TO PURCHASE
FROM LONGHORN AAP ON HAND LINE WHICH IS EXPECTED TO RESULT IN A LABOR
INTENSIVE OPERATION.

SOLUTION - THE MMAT WILL DEVELOP AUTOMATED EQUIPMENT AND REDUCE LABOR FOR
MANUFACTURE.

COMPONENT -- LOAD

(5061) TITLE - 10MM SMOKE PUN TECH FILM COVER SMOKE MUNITION

PROBLEM - A FAMILY OF NEW IMPROVED WF SMOKE SHELLS INCLUDING 60MM MORTAR IS
BEING DEVELOPED. FUTURE PRODUCTION IS DEPENDENT ON THE AVAILABILITY OF NEW
TECHNOLOGY AND PRODUCTION EQUIPMENT.

SOLUTION - DEVELOP TECHNOLOGY REQUIRED TO DESIGN PILOT EQUIPMENT FOR FILLING
IMPROVED SMOKE SHELL MUNITION INCORPORATING WICK MATERIAL WITH WP.

(L358) TITLE - PRESS/INJECTION LOADING OF INSENSITIVE HI

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

PRIOR A1 A2 A3 A4 A5

\$95

460

240

NET FIVE YEAR PLAN
R&D REQUEST LIST

FUNDING (\$1000)

PROJECT # - L&A#	PROBLEM	SOLUTION	PRIOR	F1	F2	F3	F4	F5
(CONTINUED)								
(P-44) TITLE - EASIER IMPROVED FILLING METHODS FOR M74 - OCT 61	PROBLEM - TRA FILLING METHOD IS SLOW AND CAUSES INEFFICIENT OPERATIONS.	SOLUTION - EVALUATE AND SELECT OPTIMUM FILL EQUIPMENT TO REDUCE FILLING TIME.	750					
(P-44) TITLE - NOVELIZATION OF TRACER LOADING	PROBLEM - CURRENT TRACER LOADING TECHNOLOGY UTILIZES CONSIDERABLE LABOR, SINUSUAL OPERATING TYPE PROCESSING MACHINES.	SOLUTION - DEVELOP MODERN AUTOMATIC MULTIPLE ITEM LOADING EQUIPMENT. HIGH PRODUCTION, LOW MAINTAINABILITY, ECONOMICAL AND RELIABLE EQUIPMENT ADAPTABLE TO NUMEROUS TRACER ITEMS WILL RESULT.	750					
(P-47) TITLE - DEVELOP MFG TECHNOLOGY FOR X94 CS ROCKET	PROBLEM - NEVER PRODUCED AT PRA. VITALIZATION REQUIREMENT.	SOLUTION - PROVIDE MFG TECHNOLOGY. PREVILIE DESIGN CRITERIA FOR IFF.	400					
(P-47) TITLE - BULK TRANSFER OF CHEMICAL MATERIALS	PROBLEM - CURRENT TECHNIQUE FOR RETRIEVAL WEIGHING AND TRANSPORTING PHYSICALIC CHEMICAL CONSTITUENTS ARE ACCOMPLISHED BY MAN-OF INTENSIVE OPERATION AND ARE UNSAFE.	SOLUTION - A. EFFICIENT MATERIALS HANDLING SYSTEM WILL BE SURVEYED AND DEVELOPED SO THAT PRAISNA STANDARDS WILL BE MET.	221	263				
(P-47) TITLE - NBC METHODS OF GEL FUEL FOR FAE BOARDS BL-96-A AND BL-96-B	PROBLEM - A PROCESS TO PRODUCE LARGE QUANTITIES OF THIXOTROPIC FUEL CONTAINING PROPYLENE CYCLIC OXIDES NOT EXIST. THE FUEL DUE TO ITS FLAMMABILITY AND THIXOTROPIC PROPERTIES, PRESENTS MAJOR PROBLEMS IN THE AREAS OF MIXING, STORAGE, PUMPING, AND LOADING.	SOLUTION - DETERMINE PROCESS AND MANUFACTURING TECHNIQUES SUITABLE FOR MASS PRODUCING, TRANSPORTING, AND LOADING THIXOTROPIC GEL CONTAINING PROPYLENE CYCLIC FUEL AND EVALUATE AVAILABLE PROCESSING EQUIPMENT.	473					
(P-47) TITLE - COLD PROCESSING OF EXPLOSIVES	PROBLEM - LOAD OF HMX EXPLOSIVES INTO SHAPED CHARGES + PRESSED AMMO + PRESSING PRODUCTS IS SLOW + COSTLY DUE TO HEAT. VACUUM + NOT PRISING RIG - LOT OF EXPLOSIVE TO OVERCOME POTENTIAL EXPLOSION + LOW DENSITY CHARGE PROBLEMS INJECT CHARGES CANNOT BE REALIZED.	SOLUTION - A. EXPLOSIVE HAS BEEN IFF WHICH HAS HMX AS ITS BASE. PROPERTIES SIMILAR TO OCTOL + LX14 EXPLOSIVES. CAN BE COLD PRESSED. AUTOMATING COLD PROCESSING OF HMX WOULD ENHANCE IFF USE. WILL REDUCE COST DRAMATICALLY + ELIMINATE RISK OF EXPLOSION.	750					

NET FIVE YEAR PLAN
KCS DRCT 126

COMPONENT -- LOAD	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)				
				PRIOR	'81	'82	'83	'84
(CONTINUED)								
(415) TITLE - AUTO LOADING OF CENTER CLOTH IGNITERS	PROBLEM - LOADING OF THE LONG SLENDER CLOTH EAG IS AN AREA WHICH REQUIRES HIGH LABOR COSTS AND SUBJECTS A LARGE NUMBER OF PERSONNEL TO HAZARDOUS OPERATIONS.	SOLUTION - DEVELOP A LOADING STATION TO WEIGH AND LOAD BOTH THE CENTER CORE BAG AND THE BASE PAD.	272 1160					
(433) TITLE - SILK SCREEN DEPOSITION OF PRIMARY EXPLOSIVES	PROBLEM - CURRENT NON-ELECTRIC DETONATOR FACILITIES, EQUIPMENT AND METHODS LACK VERSATILITY. PRESENT PROBLEMS IN QUALITY AND UNIFORMITY OF PRODUCT AND ARE COSTLY IN OPERATION AND MAINTENANCE.	SOLUTION - EVAL NEW IMPROVED OR MODIFIED EQUIPMENT AND TECHNIQUES FOR THE MASS PRODUCTION OF DETONATORS, USING SILK-SCREEN TECHNIQUES WITH THE ULTIMATE GOAL OF MODERNIZING PRODUCTION FACILITIES.	730					
(447) TITLE - HANDLING EQUIPMENT FOR ADAM OVERLAYS	PROBLEM - THE ADAM PROPELLANT OVERLAY IS MANUALLY CONVEYED BETWEEN SIX MODULES. THE MANUAL CONVEYANCE IS SLOW AND EXPENSES PERSONNEL TO HAZARDOUS OPERATIONS.	SOLUTION - DEVELOP A MATERIAL HANDLING SYSTEM TO AUTOMATICALLY LOAD AND UNLOAD EACH STATION AND TO CONVEY PARTS BETWEEN STATIONS DURING THE WELDING AND FILMING OPERATION.	636					
(455) TITLE - 105MM PRESS PROCESS LOADING 105MM HEAT-MFT-XM815 PROJ	PROBLEM - THE 105MM XM815 WILL BE THE FIRST TANK ROUND TO USE A PRESSED SHAPED CHARGE. A PRODUCTION PROCESS FOR PRESS LOADING MUST BE ESTABLISHED EVALUATING SEVERAL CANDIDATE EXPLOSIVES AND ESTABLISHING TOOLING AND PRESSING PARAMETERS.	SOLUTION - PROCESSING PROCEDURES WILL BE ESTABLISHED FOR CANDIDATE EXPLOSIVES AND A LIMITED NUMBER OF UNITS LOCATED, TESTED, EVALUATED. PROCESS EQUIPMENT WILL BE PURCHASED SO THAT PROD-PHTS LOADING PROCEDURES MAY BE IMPLEMENTED INTO PRODUCTION.	50 40					
(459) TITLE - LOW VOLUME AUTO MELT-POUR EQUIP FOR LOADING SMALL AP MINERS	PROBLEM - CURRENTLY, LOADING OF SMALL AP MINES IS ACHIEVED BY HIGHLY LABOR INTENSIVE OPERATIONS. LARGE VOLUME TECHNIQUES ARE NOT APPLICABLE DUE TO THE NATURE OF LOW VOLUME, HIGHLY VARIETAL QUANTITIES.	SOLUTION - DEVELOP A LOW COST, LOW VOLUME AUTOMATED MELTING SYSTEM FOR LOADING OF SMALL AP MINES.	135 145					

MMT FIVE YEAR PLAN
RCS DRMT 126

COMPONENT	--	TITLE	FUNDING (\$000)	FUNDING (\$000)				
				PRIOR	81	82	83	84
COMPONENT	--	PACK						
(42-3) TITLE - AUTO HIGH RATE UNPACK EQUIP FOR MORTAR PROPEL CHGS			603					
PROBLEM - HANDPACKING ON THE MORTAR PROPELLING CHARGES M204 AND 205 LAP LINE RESULTS IN UNSAFE CONDITIONS AND DAMAGE TO PARTS.								
SOLUTION - DEVELOP AUTOMATED EQUIPMENT TO REPLACE HANDPACKING.								
(45-1) TITLE - AUTO CARTONING OPERATIONS F/155MM			560					
PROBLEM - THE PACKOUT OF 105MM YARM KOURAGE INTO FIBER CONTAINERS WITH THE FILLER MATERIALS AND MARKINGS IS A LABOR INTENSIVE OPERATION WITH HIGH EXPOSURE OF PERSONNEL TO LIVE AMMUNITION.								
SOLUTION - DEVELOP AUTOMATED EQUIPMENT TO PACKOUT THESE 105MM ROUNDS.								
COMPONENT	--	CARTOLOGY						
(45-2) TITLE - METAL PARTS			400					
PROBLEM - PIP PROJECT 1-73-09-004C IS CURRENTLY WORKING OUT QUALITY PROBLEMS WITH THE USE OF A SPIRAL WRAPPED CARTRIDGE CASE. THIS CASE WILL REPLACE THE DIP DRAWN CARTRIDGE CASE WHICH IS CURRENTLY MASS PRODUCED.								
SOLUTION - DEVELOP TECHNIQUES TO RELIABLY AND EFFICIENTLY HANDLE MATERIAL AND MANUFACTURE CARTRIDGE CASES USING SPIRAL WRAPPING.								
(45-42) TITLE - ULTRASONIC DEEP DRAWING OF CANNON STEEL CARTRIDGE CASES			350					
PROBLEM - DEEP DRAWN STEEL CASES REQUIRE MULTIPLE DRAWS AND REQUIRE EXCESSIVE PROCESSING AND ENERGY VS BRASS.								
SOLUTION - ULTRASONIC ACTIVATION OF FORMING DIES HAS POTENTIAL FOR REDUCING DRAWING FORCES AND ELIMINATING STEPPS IN THE DRAWING PROCESS.								
COMPONENT	--	FORMING/MACHINING						
(45-5) TITLE - ALTERNATE ASSY FOR SOLDERED AND BRAZED Joints			550					
PROBLEM - GRAZING AND SOLDERING OPERATIONS REQUIRE PRECISE CONTROL OF CLEARANCES, TEMPERATURES AND FLUXES IN ORDER TO OBTAIN ACCEPTABLE JOINTS.								
SOLUTION - ALTERNATE METHODS OF JOINING COMPONENTS WILL BE INVESTIGATED TO REDUCE COST AND ENHANCE RELIABILITY.								

M&T FIVE YEAR PLAN
RCS CRCMT 126

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000's)				
				PRIOR	E1	E2	E3	E4
(DCCG)	1 TITLE -- FICKING/MACHINING	CONTINUE[]						
	2 TITLE - ADAPTIVE CONTROL OF DIMENSIONS OF METAL COMPONENTS	PROBLEM - WEAR OF CUTTING TOOLS AND GRINDING WHEELS EVENTUALLY PRODUCES OUT OF TOLERANCE DIMENSIONS.	SOLUTION - UTILIZE SENSING DEVICES AND ADAPTIVE CONTROLS TO AUTOMATICALLY COMPENSATE FOR TOOL AND WHEEL WEAR.		550	350		
(L211)	3 TITLE - ANTI-ARMOR WLD LINES F/W/E4	PROBLEM - COSTLY AND TIME CONSUMING MANUFACTURING PROCESS FOR MASS PRODUCING SELF-FORGING FRAGMENT LINERS WITH VARYING WALL THICKNESS.	SOLUTION - DETERMINE OPTIMUM PROCESS SUCH AS HYDROFORMING, ELECTROPLATING AND/OR MACHINING. PROVE OUT PROCESS.		350	350		
(L242)	4 TITLE - N/C EQUIPMENT METAL PARTS PRODUCTION	PROBLEM - NC EQUIP HAS BEEN USED IN AMMO PON LINES BUT ITS INHERENT ACCURACY AND REPEATABILITY IN MACHINING NEW COMPONENTS HAS NOT BEEN ASSESSED.	SOLUTION - USING A THREE-PHASE PROGRAM (1) STUDY FEAS OF ADAPTING AN NC MACHINE TOOL W/SIMULTANEOUS CUTTING CAPABILITY (2) IF FEASIBLE, ADAPT AN NC MACHINE TO TEST CONCEPT (3) PROOF CONCEPT IN PON ENVIRONMENT.		200	150		
(L245)	5 TITLE - FURGING OF ALUMINUM COMPONENTS	PROBLEM - FORGINGS FOR OGIVES, BASES, AND FINS ARE IMPACT EXTRuded WITH LARGE AMOUNT OF MATERIAL LEFT THAT HAS TO BE MACHINED OFF.	SOLUTION - INVESTIGATE USING NET SHAPE FORGING TO ELIMINATE MACHINING OPERATIONS AND MATERIAL WASTE.		250			
(2046)	6 TITLE - ACOUSTIC EMISSIONS TO CONTROL METAL WORKING OPS	PROBLEM - IN MANY INSTANCES DEFECTS THAT OCCUR IN THE MFG OF MUNITIONS MPTS ARE NOT SCREENED OUT UNTIL INSPECTION AT THE END OF THE LINE RESULTS IN LOTS OF SCRAP BEFORE PROBLEM IS DETECTED.	SOLUTION - ACOUSTIC EMISSION FROM METAL WORKING OPERATIONS CAN BE MONITORED AND ANALYZED TO CONTROL SPECIFIC PROCESS VARIABLES. FOR EXAMPLE, ACOUSTIC EMISSIONS CAN DETECT GENERATION OF A DEFECT IN METAL WORKING OPERATIONS OR MONITOR TOOL WEAR.		275	300		
(2756)	7 TITLE - LASER CUTTING SLOTS IN HARDENED STEEL STRUCTURES	PROBLEM - CURRENT TECHNOLOGY EMPLOYED TO FORM SLOTS IN HARDENED STEEL STRUCTURE OF VARYING THICKNESS IS SLOW AND COSTLY. A MORE COST EFFECTIVE TECHNIQUE IS REQUIRED.	SOLUTION - AGILE STATE-OF-THE-ART HIGH PROCESSOR CONTROLLED LASER CUTTING EQUIPMENT TO PRODUCE CLOSE TOLLENCED ORDNANCE CONFIGURATIONS IN HARDENED STRUCTURES.		250			

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

COMPONENT -- FORMING/MACHINING	(CONTINUED)	PRICR	'81	'82	'83	'84	'85
(27-7) TITLE - PRECISION CONE LATHE FABRICATION			160				
PROBLEM - THERE IS NO EFFECTIVE PROVISION FOR MACHINING PRECISION SHAPED CHARGE CONE LINERS IN MEDIUM RANGE PRODUCTION QUANTITIES. YEARLY PRODUCTION RATE OF COPPERHEAD FALLS IN THE MIL-RANGE CATEGORY.							
SOLUTION - MODIFY A MACHINE TO PROVIDE A BROAD RANGE OF PRECISION SHAPED CHARGE LINERS AT MODERATE VOLVES AND COMPARATIVELY LOWER COSTS.				350			
(2731) TITLE - ULTRASONIC ASSISTED MACHINING							
PROBLEM - DIFFICULT TO MACHINE MATERIALS REQUIRE REDUCED FEEDS AND SPEEDS AND INCREASED TOOL WEAR AND BREAKAGE ALL OF WHICH CONTRIBUTES TO INCREASED MACHINING COSTS.							
SOLUTION - STUDIES SHOW THAT ULTRASONIC ACTIVATION OF CUTTING TOOLS RESULTED IN REDUCE LOADS AND WEAR WHEN CUTTING DIFFICULT TO MACHINE MATERIALS. ECONOMIC BENEFITS WILL BE ESTABLISHED BY APPLYING THE LAB METHODS TO REAL WORLD MACHINING SITUATIONS.							
(3615) TITLE - IUD FOR DU CCRS			150	700			
PROBLEM - ACCELERATED CORROSION TESTING OF STABALLOY CORES HAS INDICATED A POTENTIAL CORROSION PROBLEM WITH UNCOATED STABALLOY CORES IN LONG TERM STORAGE. CONVENTIONAL COATING PROCESSES SUCH AS PAINTING AND ELECTROPLATING ARE NOT SATISFACTORY.							
SOLUTION - INVESTIGATE ION VAPOR DEPOSITED COATINGS. DETERMINE EQUIPMENT REQUIREMENTS, INSPECTION AND TEST PROCEDURES. FROCURE A PIECE OF PRODUCTION EQUIPMENT, AND ESTABLISH PROCESS PARAMETERS.							
(3206) TITLE - MANUFACTURING PROCESS FOR CALIBER .50-.30MM PENETRATORS							
PROBLEM - CURRENT PROCESS GENERATES HIGH SCRAP RATES OF RADIOACTIVE CONTAMINANTS WHICH PRESENTS DISPOSAL PROBLEMS.							
SOLUTION - DEFINE FULL PRODUCTION PROCESS AND EQUIPMENT FOR MANUFACTURE OF DU PENETRATORS BY SKewed AXIS ROLL FORMING TECHNIQUES.							
(3703) TITLE - WASP SHAPED CHARGE LINER							
PROBLEM - THE WARHEAD (WASP) SHAPED CHARGE LINER IS PROJECTED TO HAVE A DOUBLE CONTOUR WITH VARIABLE THICKNESS WALLS. MACHINING COSTS FOR THIS LINER COULD BE AS MUCH AS \$250 IN "THIN-YEAR" DOLLARS.							
SOLUTION - NO SOLUTION PROVIDED.							

MAT FIVE YEAR PLAN
RCS ERNST 126

COMPONENT	TITLE	FUNDING (\$1000)				
		F1	F2	F3	F4	F5
(CONTINUED)						
(37-1) TITLE - FROM ADVANCED MATERIAL LINES (ARG3-5)	PROBLEM - MACHINING TIME CURRENTLY REPRESENTS A LARGE PORTION OF THE WARHEAD COST WHICH WOULD BE PROHIBITIVE IN MASS PRODUCTION.	600	700			
SOLUTION - ALTERNATE FORMING PROCESSES WOULD NEED TO BE INVESTIGATED WHICH COULD ECONOMICALLY PRODUCE THE LINERS WITH THE REQUIRED PRECISION.						
(37-2) TITLE - PRODUCTION BASE FOR NOVEL SHAPED CHARGE LINERS	PROBLEM - NEW SHAPED CHARGE MATERIALS BEING INVESTIGATED TO COMBINE HIGH MASS AND PYROPHORICITY WILL HAVE NO PRODUCTION RASE BECAUSE OF THE NATURE OF THE MATERIALS.	210				
SOLUTION - A COMBINATION OF RHEOCASTING THE COMPOSITE AND PRESSURE CASTING TO REMOVE EXCESS LOW DENSITY MATERIAL CAN PRODUCE SHAPED STOCK FOR FURTHER WORKING.						
(43F9) TITLE - IMPROVED PROJECTILE CAVITY SURFACE	PROBLEM - THE FORGING PROCESSES + TECHNIQUES CURRENTLY USED CAN CAUSE DEFECTS + IMPERFECTIONS ON THE CAVITY SURFACE. THIS CONDITION NEEDS CORRECTION TO PREVENT SENSITIVITY PROBLEM THAT CAN OCCUR WITH THE COMP EXPLOSIVE TO BE USED IN HE ROUNDS.	545	528			
SOLUTION - INVESTIGATE THE VARIOUS OPERATIONS SUCH AS NICK AND BREAK BILLET SEPARATION, SCALE, TOOL WEAR OF FC, + AND FOREIGN MATTER BUILD-UP.						
(43F10) TITLE - ABRASIVE MACHINING IN PROJECTILE MANUFACTURING	PROBLEM - NEW GENERATION OF PROJECTILES HAVE HIGH HARNESS AND ARE MADE FROM ALLOY AND HIGH FRAGMENTATION STEELS. CONVENTIONAL MACHINING THESE ALLOYS REQUIRE SURFACE SPEEDS LOWER THAN AGRMALLY EXPECTED WITH CARBON STEELS AND ARE CONSEQUENTLY HIGHLY IN COST.	150	320			
SOLUTION - ABRASIVE MACHINING TECHNIQUES CAN BE USED TO INCREASE THE METAL REMOVAL RATES WHEN MACHINING THE NEW GENERATION PROJECTILES MADE WITH HARD STEEL ALLOYS. THIS PROGRAM WILL INVESTIGATE BOTH RIGID AND FLEXIBLE SURFACE ABRASIVE MACHINING TECHNIQUES.						
(451P) TITLE - IMPROVED TOOL STEELS FOR PROJECTILE MANUFACTURE	PROBLEM - SELECTING TOOL GRADE, HEAT-TREAT CYCLE AND SURFACE FINISH FOR TOOLS OPERATING AT TEMPERATURES, PRESSURES AND FRICITION CONDITIONS IS A PROBLEM FOR PROJECTILE MANUFACTURERS. THE PROBLEM LEADS TO POOR SURFACE QUALITY OF PROJECTILE CAVITIES.	400				
SOLUTION - AN EVALUATION OF NEW TOOL STEEL AND HARD FACING MATERIALS FOR METAL FORMING IS NEEDED TO ESTABLISH TOOL STEEL GRADES AND/OR HARD FACING PARAMETERS TO MEET THE SEVERE CONDITIONS ENCOUNTERED IN PROJECTILE MANUFACTURING OPERATIONS.						

MMT FIVE YEAR PLAN
RCS ORCMT 126

COMPONENT -- FORMING/MACHINING	TITLE	(CONTINUED)					FUNDING (\$000's)
		PRIOR	81	82	83	84	
(44519) TITLE - OUTLINE AUTOMATIC DETECTION OF TOOL WEAR							
PROBLEM - TOOL WEAR ON SEMIAUTOMATIC METAL MACHINES CAUSE DEFECTIVE PARTS IF UNDETECTED.							
SOLUTION - PROVIDE AN AUTOMATIC MEASURING DEVICE ON THE TRANSPORTER OF THE LOAD/ UNLOAD SYSTEM.							
(44528) TITLE - ROTARY FORGING OF DU PENETRATORS							
PROBLEM - CURRENT FABRICATION TECHNIQUES FOR THE PRODUCTION OF DU PENETRATORS INVOLVE CONSIDERABLE MACHINING WITH ASSOCIATED HIGH COST AND WITH ACCOMPANYING PROBLEMS OF DISPOSAL OF THE RESULTANT MATERIAL SCRAP.							
SOLUTION - APPLICATION OF ROTARY FORGING TECHNOLOGY TO THE FABRICATION OF NEAR NET SHAPE DU PENETRATORS RESULTING IN CONSIDERABLY LESS FINISH MACHINING AND SCRAP.							
(44529) TITLE - MFG OF TWO PIECE NOSE FOR HEAT PROJECTILE							
PROBLEM - THE FUTURE GENERATION HEAT PROJECTILES NOW IN DEVELOPMENT EMPLOY TWO-PIECE CONICAL NOSE. THE TOLERANCES REQUIRED FOR THE LOW-DRAG OUTER PROFILE AND FOR THE GAP BETWEEN INNER AND OUTER CONES PRESENT A PRODUCTION PROBLEM.							
SOLUTION - EVALUATE TWO ALTERNATE METHODS OF PRODUCTION, I.E., SHEAR FORMING VS DRAW/ ANNEAL. PHASE ONE WOULD TEST 50 PROJECTILES PRODUCED BY EACH CANDIDATE PROCESS. PHASE TWO WOULD FABRICATE 100 PROJECTILES BY THE PRODUCTION PROCESS CHOSEN DURING PHASE ONE.							
(44530) TITLE - MFG OF PRECISION CONES FOR HEAT PROJECTILES							
PROBLEM - THE HEAT PROJECTILE LINER MUST BE HELD TO .003" IN ANY TRANSVERSE PLANE AND WITHIN .006" ALONG ITS LENGTH. THE TOLERANCES ARE AT THE EXTREME LIMIT OF ACCURACY. THE #M815 LINER REQUIRES PRECISION AN ORDER OF MAGNITUDE GREATER (.0005").							
SOLUTION - PHASE ONE WOULD EXAMINE TWO CANDIDATE PROCESSES - SHEAR FORMING AND DRAW/ANNEAL. FIFTY ROUNDS WOULD BE TESTED BY EACH PROCESS. ONE CANDIDATE PROCESS WILL BE CHOSEN FOR FURTHER DEVELOPMENT DURING THE SECOND PHASE.							
(46716) TITLE - DEV COMP-AID MODEL OF FOFMING OPERATIONS FOR ARTILLERY MPTS							
PROBLEM - TRIAL AND ERROR METHODS AND THE ABSENCE OF PROVEN AUTOMATED DESIGN TECHNIQUES FOR TOOLING CAUSE UNEXPECTED FAILURES IN FORMING OPERATIONS AND DELAYS IN STARTUP OF AMMUNITION PRODUCTION LINES.							
SOLUTION - DEVELOP ANALYTICAL MODELS AND AUTOMATED TOOL DESIGN METHODS OF CRITICAL METAL FORMING OPERATIONS. TOOL DESIGNS THUS GENERATED WILL BE TESTED IN A PRODUCTION SETTING TO VERIFY THE COMPUTER MODELS. PROVEN MODELS ARE APPLICABLE TO CURRENT AND FUTURE ITE							

MWT FIVE YEAR PLAN
RCS DRMT 126

COMPONENT -- PROJECTILES	TITLE - AUTOMATED MATERIAL HANDLING	FUNDING (\$000)				
		PRIOR	82	83	84	85
(0006) PROBLEM - MATERIAL HANDLING IN MUNITIONS METAL PARTS PROCESSING IS A SIGNIFICANT ELEMENT OF COST.	SOLUTION - NEW AUTOMATIC HANDLING DEVICES SUCH AS PROGRAMMABLE ROBOTS WILL BE INVESTIGATED FOR APPLICABILITY TO MUNITIONS COST REDUCTION.	300				
(0113) PROBLEM - FILLET NICKING IMPROVEMENT	PROBLEM - PRESENT PRACTICE OF TOUCH NICKING OF STEEL BILLETS FOR PROJECTILE FORGING PRODUCES A PERCENTAGE OF NON-UNIFORM BREAKS THAT RESULT IN FORGING REWORK OR SCRAP.					
(0113) SOLUTION - INVESTIGATE OTHER FORMS OF NICKING SUCH AS PLASMA ARC, ELECTRON BEAM AND LASER TO IMPROVE JUILITY OF BREAKS.						
(0114) PROBLEM - IMPROVED SWAGING OF ROTATING FANDS	PROBLEM - WEST TIRE SETTER BANDING MACHINES ARE COMMONLY USED FOR SWAGING ROTATING HANDS TO PROJECTILE ECIES. THE COMPANY IS NO LONGER IN BUSINESS AND PARTS ARE NOT AVAILABLE FOR IPE IN EASE. NEW LAMOTATICS AT SCRANTON AND LOUISIANA ARE NOT OPERABLE.	300				
(0114) SOLUTION - INVESTIGATE NEW EQUIPMENT DESIGNS TO REPLACE WEST TIRE SETTERS.						
(0115) PROBLEM - SINTERED IRON ROTATING BAND FOR 20MM M221/M246	PROBLEM - UNDER FIP 1-P0-09-0005 AN ALTERNATE MATERIAL, SINTERED IRON, IS TO BE QUALIFIED TO REPLACE THE STANCAPE COPPER BAND ON AUTOMATIC CANNON AMMUNITION. CURRENT MANUFACTURING TECHNIQUES PROVIDES FOR EMPLACEMENT OF A COPPER BAND.	250	300			
(0115) SOLUTION - DEVELOP THE NECESSARY MANUFACTURING TECHNIQUES WHICH TAKES INTO ACCOUNT THE SINTERED IRON BAND MATERIAL.						
(0116) PROBLEM - COLE SHEARING OF ALUMINUM SLUGS FOR FORGING	PROBLEM - CURRENTLY ALUMINUM BILLETS ARE SAWED TO PROVIDE SLUGS FOR FORGING. THE KERF LOSS IS APPROXIMATELY 1.24% FOUND PER SLUG.	120				
(0116) SOLUTION - ADVANCES IN THE STATE-OF-THE-ART OF COLE SHEARING AND POTENTIAL COST SAVINGS WOULDANTS INVESTIGATION OF COLE SHEARING ALUMINUM SLUGS FOR FORGING.						
(0117) PROBLEM - AUTO SWAGING FOR 1 INCH PROJECTILE						
(0117) SOLUTION - CURRENT INSPECTION IS IMAGE PLATE TO MEET 5 INCH PROJECTILE PROPS REQUIREMENT AND SPECIFIES DESIGN CHARACTERS.						
(0117) SOLUTION - LEVEL OF AUTOMATED ACCEPTANCE INSPECTION SYSTEM FOR 5 INCH 3P AND 1 INCH 4 CALIBER PROJECTILE BODIES.						

MAT FIVE YEAR PLAN
RCS ORCPT 126

COMPONENT -- PROJECTILES	FUNDING (\$000)			
	PRIOR	81	82	83
(CONTINUED)		84	85	

COMPONENT -- PROJECTILES

(32c9) TITLE - POWDERED METAL (PM) FOR LOW DRAG 20-40MM PROJECTILES

PROBLEM - LOW DRAG PROJECTILES REQUIRE SIGNIFICANT AMOUNT OF MACHINING AND INSPECTION. CONSEQUENTLY, EACH PROJECTILE IS EXPENSIVE AND THE PROCESS SEVERELY LIMITS PRODUCTION RATES.

SOLUTION - FM MANUFACTURING TECHNIQUES MAY INCREASE PRODUCTION RATES WHILE REDUCING COST. A SECONDARY COINING OPERATION MAY OR MAY NOT BE REQUIRED; HOWEVER, THE TOTAL MACHINING OPERATION IS REDUCED TO, AT MOST, TWO.

(41c9) TITLE - HIGH FRAGMENTATION STEEL PRODUCTION PROCESS

PROBLEM - THE CURRENT PRODUCTION PROCESS FOR MANUFACTURING HF1 PROJECTILES IS EXTREMELY EXPENSIVE. PROPRIETARY PRODUCTION PROCESSES DEVELOPED BY PRIVATE INDUSTRY ARE NOT AVAILABLE.

SOLUTION - EXAMINE NEW AND IMPROVED PRODUCTION PROCESSES FOR REDUCTION OF STARTING MULTI-PIGHT, MACHINING TECHNIQUES. ANNEALING FORGINGS, ONE-HIT HOT NOSING, HEAT TREATING AND FRACTURE TOUGHNESS. WILL COMPLETE A TOP FOR COMPETITIVE PROCUREMENT.

(4517) TITLE - PROCESS FOR RECYCLING STARALLOY MACHINING CHIPS

PROBLEM - STARALLOY CHIPS ARE PYROPHORIC AND MUST BE DISPERSED IN AN INERT MATERIAL TO BE DISPOSED OF BY BURIAL AS A RADIOACTIVE MATERIAL. RECYCLING INTO USABLE METAL WOULD SOLVE DISPOSAL PROBLEMS.

SOLUTION - CONTINUE EFFORT INITIATED IN FY80 WARDIRECTED FY79 FUNDS. VARIOUS APPROACHES TO CHIP RECYCLING ARE BEING EXPLORER. ONE APPROACH SHOWING MOST ADVANTAGES WILL BE SELECTED FOR FURTHER OPTIMIZATION IN FY83.

(673c) TITLE - ULTRA-HIGH SPEED METAL RECYCLING. ARTILLERY SHELL

PROBLEM - DUE TO THE LOW METAL RECOVERY RATES OF THE CURRENT CONVENTIONAL MACHINING OPERATIONS, A GREATER NUMBER OF MACHINES ARE REQUIRED TO PRODUCE ARTILLERY PROJECTILES.

SOLUTION - TO ACHIEVE INCREASED METAL RECOVERY RATES ALSO TO REDUCE THE NUMBER OF MACHINES CURRENTLY USED TO PRODUCE PROJECTILES.

COMPONENT -- TOOLING

(32c9) TITLE - PRECISION TOOLING FOR SMALL CALIBER AMMUNITION

PROBLEM - COST OF TOOLS AND REPLACEMENT/SETTING TIME ARE SIGNIFICANT FACTORS IN THE COST OF AMMUNITION. WORK IN THE CAN INDUSTRY SHOWS THAT SIGNIFICANT IMPROVEMENTS IN CLOSER TOLERANCES, IMPROVED GRINDING METHODS, AND TOOL LIFE CAN BE ACHIEVED.

SOLUTION - INDUSTRY TECHNIQUES WILL BE EVALUATED. SAMPLES WILL BE PRODUCED AND EVALUATED. IF ACTUAL PRODUCTION ENVIRONMENTS, COST AT TOOL LIFE WILL BE OPTIMIZED.

MAT FIVE YEAR PLAN
RCS DRCMT 126

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)				
				PRIOR	E1	E2	P3	E4
CONTINUE)								
COMPONENT -- TOOLING	(4164) TITLE - ANALYSIS FOR PREDICTING FAILURE OF MFG TOOLING	PROBLEM - THE ABILITY TO PREDICT FAILURE OF MACHINE OR COMPONENTS IS NON-EXISTANT. FAILURES ARE COSTLY AND REDUCE PRODUCTION OUTPUT.	SOLUTION - FREQUENCY ANALYSIS WILL IDENTIFY MACHINE PARTS WHICH ARE DEFECTIVE, OVERLOADED, OR NOT OPERATING PROPERLY.	114	147			

COMPONENT -- CATE G OR Y	(1318) TITLE - EST CHEM PROC + FILL CLOSE + LAP TECH F/FVX2 YM736	PROBLEM - THE GL PROCESS FOR VX FINARY MFG RESULTS IN LARGE QUANTITIES OF WASTE, AND ORGANIC PHOSPHOROUS COMPOUNDS. PRIOR PROCEDURES FOR DISPOSAL (DEEP WELL) ARE NO LONGER ACCEPTABLE. NEW TECHNIQUES ARE REQUIRED.	SOLUTION - ESTABLISH PROCESSES TO REDUCE WASTE BY-PRODUCTS AND PROVIDE METHODS FOR DISPOSAL OF UNAVOIDABLE WASTE MATERIAL FROM PROCESS MFG.	50	682	216		
COMPONENT -- CHEMICAL	(429P) TITLE - EVALUATION OF DMN DISPOSAL ON HSAAP E-LINE	PROBLEM - EFFLUENT FROM AMONIA RECOVERY COLUMN CONTAINS SIGNIFICANT AMOUNTS OF DMN. DMN IS ONE OF THE EPA CONSENT DECREE COMPOUNDS FOR WHICH WATER QUALITY CRITERIA MUST BE PROVIDED. EPA INSISTS ON LEVELS BELOW 0.3 PPB.	SOLUTION - EVALUATE UV PHOTOLYSIS CATALYTIC HYDROGENATION, CARBON ADSORPTION OR OTHER TECHNIQUES FOR ABATING OR DESTROYING DMN.		472	391	300	
COMPONENT -- GENERAL	(1354) TITLE - SLUDGE VOLUME REDUCTION AND DISPOSAL PROCESS STUDY	PROBLEM - MCA POLLUTION AWARENESS FACILITIES UNDER CONSTRUCTION AT PINE FLUFF ARSENAL DISCHARGE INTO A SETTLING LAGOON HAVING A FIVE YEAR CAPACITY BUT NO CLEAN OUT OR SLUDGE DISPOSAL EQUIPMENT. TO EXTEND LAGOON LIFE-SPAN, SLUDGE VOLUME MUST BE MINIMIZED.	SOLUTION - PROVIDE A PROCESS FOR LAGOON SLUDGE CLEAN-OUT + DEWATERING FOR LANDFILL DISPOSAL. VOLUME WILL BE REDUCED BY PRECLARIFICATION + EQUALIZATION TO MINIMIZE CHEMICAL TREATMENT REQUIREMENTS. EVALUATE OTHER TREATMENT CHEMICALS TO REDUCE SLUDGE VOLUME.		278	110		

MIL FIVE YEAR PLAN
HCS DRAFT 126

COMPONENT -- GENEKAL

(CONTINUE!)

(17) #1 TITLE - POLLUTION ABATEMENT CONSEQUENCE EVALUATIONS

PROBLEM - PEA POLLUTION ABATE FAC HEAVY CONSUMER OF VALUABLE RESOURCES. FLWS FROM PBN AREAS ARE NOT CURRENTLY MONITORED NOR EQUALIZED PRIOR TO TREATMENT. CREATING SITUATION WHERE CHEM FEEDERS MUST BE SET A RATE TO TREAT PERIODIC SLUGS W/O NPDES.

SOLUTION - SURVEY OF WATER + CHEM UTIL IN POLLUTION ABATE FAC BE CONDUCTED IDENT CONTROL METHODS TO MINIMIZE FLCW. CHEM UTIL + REDUCE SLUDGE GENERATION. EVAL OF USE OF CONTINUOUS MONITORS IN INFLUENT EQUAL BASIN COULD MINIMIZE/OPTIMIZE CHEM + WATER USAGE

(42-6) TITLE - ON-LINE MONITORS FOR WATER POLLUTANTS

PROBLEM - IDENTIFICATION AND MONITORING OF INDIVIDUAL MILITARY UNIQUE EFFLUENT POLLUTANTS REQUIRED BY WATER POLLUTION CONTROL ACT.

SOLUTION - DEMONSTRATE PROTOTYPE CONTINUOUS MONITORS DEVELOPED UNDER R&D PROGRAM BY FIELD TESTS ON AAP WASTEWATER EFFLUENT DISCHARGE STREAMS.

(42-7) TITLE - DISPOSAL OF WASTE WATER TREATMENT SLUDGE

PROBLEM - WASTEWATER TREATMENT FACILITIES OF AAP'S GENERATE LARGE VOLUMES OF SLUDGE FOR WHICH LAND FILL DISPOSAL WILL BE PROHIBITED AND WHICH WILL REQUIRE COSTLY ALTERNATE DISPOSAL METHODS.

SOLUTION - ALTERNATE DISPOSAL TECHNIQUES WILL BE INVESTIGATED THAT WILL ELIMINATE PROPELLANT CONTAMINANTS BY PHYSICAL CHEMICAL THERMAL DESTRUCTION AND RECLAIM HEAVY METALS AND COMPOUNDS FOR REUSE IN THE MANUFACTURING PROCESS.

(42-8) TITLE - IN-PLANT REUSE OF POLLUTION ABATED WATERS

PROBLEM - MORE STRINGENT STANDARDS FOR MILITARY UNIQUE POLLUTANTS. 1985 GOAL OF ZERO DISCHARGE. EXPENSE OF TREATING POLLUTION. CONTINUE THIS REUSE OF TREATED WATER IN OTHER PROCESSES.

SOLUTION - THIS PROJECT CONCENTRATES EFFORT IN RECYCLING OF TREATED WASTE WATER WITH THE ULTIMATE GOAL OF COMPLYING WITH THE ZERO DISCHARGE GUIDELINE.

(42-9) TITLE - NOISE POLLUTION ABATEMENT F/SCAMP IN LCAAP

PROBLEM - NOISE LEVEL EXCEEDS 85 LPS IN BLDG 1 AT LAKE CITY AAP.

SOLUTION - INSTALL RECOMMENDED ONE SUPPRESSOR SYSTEM AND EVALUATE ALL OTHER SUPERMODULES.

FUNDING (\$000)

PRIOR P1 P2 P3 P4 P5

230

426

98

313

464

240

264

MIL FIVE YEAR PLAN
ACG DIRECT 126

CON - GENERAL

(44-4) TITLE - N-LINE 10 O'CLOCK MIXED WASTE STREAMS

PROBLEM - PLANT REQUIRES THAT WASTE DISCHARGES BE MONITORED TO ASSURE THAT AQUATIC LIFE ARE PROTECTED FROM TOXIC/HAZARDOUS SUBSTANCES. IN ADDITION, MICROBIOLOGICAL MONITORING WILL SOON BE REQUIRED IN SOME NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS.

SOLUTION - USE A BIOLOGICAL MONITORING SYSTEM TO EVALUATE TOXIC EFFECTS. FROM CORRELATIONS BETWEEN CHEMICAL CONSTITUANTS IN THE WASTE WATER AND BIOLOGICAL RESPONSES, EXTENSIVE CHEMICAL MONITORING MIGHT BE ELIMINATED.

COMPONENT - PROPELLANTS/EXPLOSIVES

(44-5) TITLE - RED WATER POLLUTION ABATEMENT SYSTEM

PROBLEM - RED WATER PRODUCED IN VOLUME FROM THE PURIFICATION OF TNT IS A POLLUTANT FOR WHICH A SATISFACTORY DISPOSAL METHOD DOES NOT EXIST.

SOLUTION - THE FEASIBILITY OF THE SONOCO SULFITE RECOVERY PROCESS FOR THE DISPOSAL OF RED WATER HAS BEEN DEMONSTRATED. THIS PROJECT OPTIMIZES OPERATING PARAMETERS OF CRITICAL COMPONENTS TO SUPPORT AN MCA PROJECT FOR RAEFORD AAP.

(44-6) TITLE - ADVANCED PINK WATER TREATMENT

PROBLEM - CURRENT PINK WATER DISPOSAL TECHNOLOGY THROUGH CARBON ABSORPTION IS HIGH IN COST EVEN WHEN REGENERATION TECHNIQUE IS UTILIZED.

SOLUTION - ALTERNATIVE TECHNOLOGIES ARE AVAILABLE WHICH CAN REDUCE THIS TREATMENT BY 50 PERCENT. IT IS LIKELY THAT A HYBRID SYSTEM WILL BE DEVELOPED THAT CAN BE RETROFITTED TO THE CURRENT SYSTEMS.

(44-7) TITLE - TERTIARY TREATMENT OF HOLSTON WASTE WATER

PROBLEM - FACILITY PROJECT AT HOLSTON REQUIRES TERTIARY TREATMENT TO MEET DISCHARGE STANDARDS FOR NITROCLICS. CARBON ABSORPTION OR A HYBRID TREATMENT SYSTEM IS NEEDED.

SOLUTION - THIS PROJECT WILL COMPLETE PILOT WORK TO ESTABLISH DESIGN CRITERIA AND OBTAIN DATA FOR THE TERTIARY TREATMENT SYSTEM.

(44-8) TITLE - ADVANCED POLLUTION ABATEMENT FOR DARCOM FACILITIES

PROBLEM - MUCH WORK HAS BEEN DONE IN THE PROPELLANTS AND EXPLOSIVES PLANTS TO MEET THE POLLUTION ABATEMENT STANDARDS. HOWEVER, ALL OF THE GOALS HAVE NOT YET BEEN MET.

SOLUTION - DEVELOP TECHNOLOGY TO DISPOSE OF WASTEWATER TREATMENT SLUDGE, TO PROVIDE TERTIARY TREATMENT OF HAP WASTEWATER TO TREAT PINK WATER, AIR EMISSION AND DETONATOR WASTE, AND TO PROVIDE ENVIRONMENTAL IMPROVEMENTS FOR NITRATE ESTERS.

CONTINUOUS

FUNDING (\$000)

Prior 61 62 63 64 65

258 290

MMT FIVE YEAR PLAN
RCS DRCP 126

FUNDING (\$000)

COMPONENT	-- PROPELLANTS/EXPLOSIVES	(CONTINUED)
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(4511) TITLE - DISPOSAL OF FINAL SLUDGE FROM ACID RECOVERY OPERATIONS

(CONTINUED)

PROBLEM - RECOVERY OF SODIUM NITRATE AFTER HMX/RDX PROD AT HSAAP IS COSTLY AND CAUSES POLLUTION. SODIUM NITRATE RESULTS BECAUSE SODIUM HYDROXIDE IS USED IN THE ACID PLANT TO NEUTRALIZE RESIDUAL NITRIC ACID AND EXPLOSIVES IN THE SPENT ACID.

SOLUTION - USE AMMONIA IN THE FORM OF AMMONIUM ACETATE TO NEUTRALIZE EXCESS NITRIC ACID. AMMONIUM NITRATE SLUDGE WILL BE CATALYTICALLY HYDROGENATED TO DESTROY OTHER RESIDUES. FINAL SOLUTION IS NH₄NO₃ IN WATER AND HAS A VALUE 4 TO 5 TIMES THAT OF SODIUM NITRATE.

COMPONENT -- RECYCLE

(4511) TITLE - POLLUTION ARATE FOR RECYCLE OF MET-ILLUMINANTS

PROBLEM - SCRAP PYROTECHNIC COMPOSITION IS DISPOSED BY BURNING CAUSING AIR POLLUTION. ALSO POWDERED MAGNESIUM IS LOST AND IT IS A CRITICAL MATERIAL IN SHORT SUPPLY.

SOLUTION - NAVY AT CRANE INDIANA HAS COMPLETED R&D WORK ON RECOVERING AND RECYCLING OF POWDERED MAGNESIUM. SIGNIFICANT COST SAVINGS ARE PROJECTED. THIS PROJECT WILL CONDUCT THE REQUIRED PILOT WORK TO SUPPORT FACILITY DESIGN.

(4512) TITLE - CAUSTIC RECOVERY FROM SODIUM NITRATE SLUDGE

PROBLEM - HOUSTON IS CURRENTLY LOSING \$40 FOR EACH TON OF SODIUM NITRATE BY-PRODUCT SOLD. SODIUM NITRATE IS EXTREMELY DIFFICULT TO DISPOSE OF BECAUSE OF COMPETITION FROM OTHER FERTILIZERS ON THE MARKET.

SOLUTION - CONVERT SODIUM NITRATE INTO SODIUM HYDROXIDE FOR REUSE IN SPENT ACID RECOVERY OPERATIONS AT HOUSTON. A SUBSTANTIAL COST BENEFIT RESULTS BY REDUCING THE AMOUNT OF NEW SODIUM HYDROXIDE SOLUTION TO BE PURCHASED.

(4544) TITLE - MET WASTE DISPOSAL TECH FOR MET PRIMARY PROJ FAC

PROBLEM - LARGE QUANTITIES OF SOLID WASTES ARE GENERATED DURING DF MFG. THERE IS NO ACCEPTABLE DISPOSAL METHOD. LIQUID STORAGE IS NOT FEASIBLE AND LANDFILL MAY REQUIRE SPECIAL PREPARATION.

SOLUTION - DEVELOP PROCEDURES FOR DECREASING THE AMOUNT OF SOLID WASTE GENERATED. RECOVER WASTES IN THE FORM OF LIQUID HCl WHICH CAN BE USED IN THE CENTRAL LMU FACILITY AND RECYCLE STILL BOTTOMS WHICH WILL REDUCE SOLID WASTE BY 80 PERCENT.

* COPY *

* PROPELLANTS *

MMI FIVE YEAR PLAN
RCS DRMT 126

(FUNDING \$4000)

COMPONENT -- HALL		PRIOR	81	82	83	84	85	FUNDING (\$4000)
(370) TITLE - NITROCELLULOSE & NITROGLYCERINE RECOVERY FROM SCRAP PROPELLANT CURRENTLY BACKLOGGED FOR DISPOSAL. THE NORMAL DISPOSAL METHOD IS BURNING WHICH CAUSES AIR POLLUTION.			255	1010				
SOLUTION - DEVELOP A PROCESS TO SAFELY AND ECONOMICALLY RECOVER THE NITROCELLULOSE AND IF POSSIBLE, THE NITROGLYCERINE CONTAINED IN THE DOUBLE BASE PROPELLANTS. THESE MATERIALS COULD THEN BE USED IN THE PRODUCTION OF BALL PROPELLANT.								
(4540) TITLE - CALCIUM CARBONATE COATING OF 7.62MM BALL PROPELLANTS		250	90					
PROBLEM - A SAFE AND EFFICIENT PROCESS IS NOT CURRENTLY AVAILABLE FOR THE CUTTING OF 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.								
SOLUTION - UTILIZE AN EXISTING TWO-STAGE CONTINUOUS PILOT SCALE COATER AT OLIN'S ST. MARKS, FL FACILITY TO DEVELOP A SAFE AND EFFICIENT PROCESS TO COAT 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.								
COMPONENT -- BENITE								
(4210) TITLE - DRY CUTTING OF ENERGETIC MATERIALS		449	52					
PROBLEM - BENITE STRANES ARE CUT TO REQUIRED LENGTHS USING A MILLING MACHINE WITH TWO CIRCULAR SAWS. THIS IS UNUSUALLY COSTLY BECAUSE OF EXCESSIVE HANDLING, AND ADDITIONAL DRYING AND INSPECTION OPERATIONS.								
SOLUTION - INITIATE HIGH PRESSURE WATER IN FORM OF A FINE JET STREAM TO CUT BENITE STRANES. THIS WILL REDUCE THE NUMBER OF OPERATIONS, ELIMINATE HANDLING, DRYING/INSPECTING OPERATIONS, AND REDRYING WILL BE MINIMIZED.								
COMPONENT -- GENERAL								
(4510) TITLE - EMERGING PROPELLANT MFG TECHNOLOGY								
PROBLEM - MANY PROCESSES FOR MANUFACTURE OF PROPELLANTS USE TECHNIQUES DEVELOPED DURING WORLD WAR II. SUCH PROCESSES INVOLVE COSTLY BATCH-TYPE, LARGE LABOR-INTENSIVE OPERATIONS. THESE METHODS ARE EXCESSIVE ENERGY USERS AND POLLUTION GENERATORS.								
SOLUTION - DEVELOP MORE EFFICIENT, COST EFFECTIVE PROPELLANT PRODUCTION PROCESSES, UTILIZING CONTINUOUS AND AUTOMATED TECHNOLOGY. BENEFITS INCLUDE, PRODUCT CONSISTENCY, POLLUTION, AND ENERGY CONSUMPTION.								

P&I FIVE YEAR PLAN
RCS DRAFT 126

FUNDING (\$000)

COMPONENT	-- GENERAL	CONTINUE ()					
		PRIOR	81	82	83	84	85
(4145) TITLE - CONTROL DRYING IN AUTO SF AND WALL PROP MFG			327	553			
PROBLEM - OFF-LINE ANALYSIS FOR MCISTURE AND VOLATILES MAKES IT DIFFICULT TO CONTROL A CONTINUOUS DRYING OPERATION SINCE THE TIME REQUIRED FOR ANALYSIS IS LONG COMPARED TO THE RESIDENCE TIME FOR THE PROPELLANT IN A CONTINUOUS DRYER.							
SOLUTION - USE PRODUCT TEMPERATURE AND/OR ON-LINE ANALYZERS AND FLOW METERS AS A BASIS FOR IMPROVED CONTROL OF A CONTINUOUS DRYING OPERATION AND REDUCE THE AMOUNT OF OFF-LINE ANALYSIS REQUIRED.							
(4273) TITLE - AUTO PRODUCTION OF STICK PROPELLANT							
PROBLEM - PRESENT BATCH TECHNIQUES FOR STICK PROPELLANT MFG INVOLVE MUCH HAND LABOR THEREBY RESULTING IN LIMITED PRODUCTION CAPACITY. HIGH COST. AND HAZARD EXPOSURE.							
SOLUTION - INSTALL AND EVALUATE FROTCOTYPE EQUIPMENT TO AUTOMATICALLY PRODUCE RACKED SOLVENT-TYPE STICK PROPELLANT. WHICH WILL BE CUT BY FLUID JET CUTTER. THIS PROCESS WILL OPERATE WITH EXISTING 12 INCH PRESS AND PRESS BAY.							
(4533) TITLE - LOVA PROPELLANT MANUFACTURING PROCESS							
PROBLEM - VUL OF PROP TO VAR ATTACK FORCES CONTRAIN MAJOR PORTION OF PROBABILITY OF LOSING A FITTING VEHICLE. VUL OF FULK PROPELLANT IN COMPLETE ROUND ASSEMBLY. STORAGE OR TRANSPORT IS ALSO A PROBLEM. THIS CHARAC IS INHERENT IN CURRENT MULTIBASE FORMULATION							
SOLUTION - CLASS OF PROP UTIL NITRAMINES REDUCES PROB TO ACCEPT LEVELS. A PROCESS F/MFG OF LOVA PROP + AN INERT BINDER BY DEV. PILOT SCALE PROCESS EQUIP HE ASSEMBLED TO PROV AN ENERGETIC PROP IN OPTIMUM GEOMETRIC CONFIG F/PALLSTIC EVAL IN SPEC APPLICATIONS.							
COMPONENT -- MISCELLANEOUS							
(1019) TITLE - CONVERSION OF SURPLUS PENTABORANE TO B10							
PROBLEM - THE DIBORANE (F2) USED IN THE MANUFACTURE OF DECARBORANE (B10) IS A COST DRIVER.							
SOLUTION - DEVELOP A PROCESS TO FIX GOVERNMENT OWNED PENTABORANE (B5) WITH B2 TO REDUCE THE COST OF THE PRODUCT B10.							

MOT FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	--	TITLE	FUNDING (\$CCC)	F10K				
				F1	F2	F3	F4	F5
COMPONENT	--	MULTI-BASE						
(4512)	TITLE	AUTOMATED DIE CUTTER FOR 12-INCH PRESS	625					
PROBLEM	-	PRODUCTION OF DOUBLE- AND TRIPLE-BASE GRANULAR PROPELLANT REQUIRES EXTRUSION OF STRANDS INTO COMPARTMENTS ON A BUGGY. THE STRANDS ARE MANUALLY FED TO A CUTTER AND THE GRAINS ARE PLACED IN DRYING TRAYS. THIS PROCESS REQUIRES NUMEROUS PERSONNEL.						
SOLUTION	-	DEVELOP A PROTOTYPE CUTTING AND MATERIAL HANDLING SYS OF AUTOMATIC CUTTERS MOUNTED BELOW THE PRESS WHICH FEED, MEASURE, AND CUT THE INDIVIDUAL STRANDS TO THE DESIRED LENGTH. THE CUT GRAINS DROP INTO CONTAINERS FOR MOVEMENT TO A TRAYING STATION.						
(4511)	TITLE	CONTINUOUS PRODUCTION OF NEW PROPELLANTS ON CAMEL	760					
PROBLEM	-	VARIOUS HIGH ENERGY AND LOVA GRANULAR AND STICK MULTI-BASE PROPELLANTS ARE BEING DEVELOPED. BATCH FACILITIES FOR MULTI-BASE PROPELLANTS HAVE A CONSTRAINED CAPACITY. A NEW CAMEL HASN'T BEEN PROVEN ACCEPTABLE ON THE NEWER PROPELLANTS.						
SOLUTION	-	ADAPT RECENTLY DEVELOPED CAMEL PROCESS TO DEMONSTRATE THE MASS PRODUCIBILITY OF THE NEW PROPELLANTS. THIS WILL INSURE A PRODUCTION BASE FOR THE NEW FORMULATIONS AND PREVENT HAVING TO USE AND/OR BUILD INEFFICIENT BATCH FACILITIES.						
(4544)	TITLE	DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS	315					
PROBLEM	-	STANDARD BALLISTIC EVALUATION TESTS ARE THE ONLY MEANS AVAILABLE FOR ASSESSING PROPELLANTS FOR HIGH PRESSURE/HIGH VELOCITY SYSTEMS SUCH AS THF 105MM AND 120MM TANK GUNS. THESE PROCEDURES ARE VERY EXPENSIVE AND TIME CONSUMING.						
SOLUTION	-	DEVELOP A THIRD GENERATION, DYNAGUN WHICH CAN BE USED IN LIEU OF STANDARD BALLISTIC TESTS AS A MORE RAPID AND LESS COSTLY MEANS OF ASSESSING PROPELLANTS FOR THF 105MM AND 120MM TANK GUNS.						
COMPONENT	--	NITROCELLULOSE						
(4019)	TITLE	PROCESS FOR MFG OF CELLULOSE NITRATE SHEET STOCK	500					
PROBLEM	-	THE ARMY INTENDS TO PURCHASE MFG RIGHTS TO THE UK MORTAR ROUND WHICH USES CN SHEET STOCK. THE CURRENT PRODUCTION METHOD OF CASTING THE CN INTO BLOCKS, AND SLICING THE BLOCKS INTO SHEETS IS TIME CONSUMING AND LABOR INTENSIVE.						
SOLUTION	-	INVESTIGATE OTHER METHODS OF MANUFACTURE. DETERMINE FEASIBILITY AND PROVIDE EQUIPMENT TO AUTOMATE THE SHEET STOCK MANUFACTURING PROCESS.						

COMPONENT	TITLE	FUNDING (\$U.S.)	PRIORITY				
			P1	P2	P3	P4	P5
(CONTINUED)							
(4.34) TITLE - IMPROVED NITROCELLULOSE PURIFICATION		1642	765				
<p>PROBLEM - EXISTING NITROCELLULOSE PURIFICATION FACILITIES WERE BUILT IN EARLY 1940'S AND ARE IN DETERIORATED CONDITION. THE PROCESS USED DATES BACK TO WWII AND CONSUMES LARGE QUANTITIES OF ENERGY AND WATER.</p> <p>SOLUTION - SELECT AND DEVELOP A NITROCELLULOSE PURIFICATION PROCESS TO BE USED IN THE MODERNIZATION PROGRAM WHICH IS MORE ENERGY AND WATER EFFICIENT. THE METHOD SELECTED IS BASED ON THE SWISS CORICELL PROCESS AS A RESULT OF THE FY77 EFFORT.</p>							
(4.514) TITLE - NONCONFINING NITRATING ACID REMOVAL		70	635	675			
<p>PROBLEM - THE CONTINUOUS NITRATION PROCESS USES A CONTINUOUS COUNTER CURRENT WASH TYPE CENTRIFUGE. OPERATIONAL DIFFICULTIES CAN LEAD TO AN EXCESSIVE AND UNSAFE ACCUMULATION AND CONFINEMENT OF ACID WET UNSTABLE NITROCELLULOSE.</p> <p>SOLUTION - CONDUCT A SURVEY OF EQUIPMENT FOR OFF-THE-SHELF AVAILABILITY. MINIMIZE FLOOR AREA REQUIREMENTS TO AVOID ADDITIONAL BUILDING REQUIREMENTS. PROCURE, INSTALL, AND EVALUATE THE EQUIPMENT SELECTED OR DESIGNED.</p>							
COMPONENT	-- NITROGUANIDINE						
(4.955) TITLE - NG CRYSTALLIZATION FOR CONTINUOUS FRUP LINES		271	190				
<p>PROBLEM - NITROGUANIDINE PRODUCED ON THE NEW LINE AT SUNFLOWER APP IS EXPECTED TO HAVE A DIFFERENT PARTICLE SIZE DISTRIBUTION THAN THAT OF PREVIOUS SUPPLIER. THIS MAY CREATE PROCESSING PROBLEMS IN THE NEW CONTINUOUS AUTOMATED MULTI-BASE LINE (CAMEL) PROCESS.</p> <p>SOLUTION - THIS PROJECT IS TO QUALIFY THE NITROGUANIDINE PRODUCED AT SUNFLOWER APP ON THE CAMEL PROCESS AT RAFFERU APP AND DETERMINE IF THERE WILL BE ANY SERIOUS PROCESSING PROBLEMS.</p>							
(4.C61) TITLE - NITROGUANIDINE PROCESS OPTIMIZATION		260	905	925	£72		
<p>PROBLEM - A NITROGUANIDINE FACILITY IS UNDER CONSTRUCTION, SAAF TO BE OPERATIONAL IN FYRC. IT UTILIZES PROCESSS, NOT PREVIOUSLY USED COMMERCIALLY AND IT CONTAINS MANY RECIRCULATION AND SUPPORT LOOP. THE OPERATION OF WHICH ARE STRONGLY INTERDEPENDENT.</p> <p>SOLUTION - CONDUCT PROCESS IMPROVEMENT PROCEDURES USING NITROGUANIDINE SUPPORT EQUIPMENT (NS) INSTALLED UNDER PROJECT 5752632, AND APPLY EVOLUTONARY OPERATION (EVOP) TO THE NITROGUANIDINE FACILITY BEING CONSTRUCTED AT SUNFLOWER APP.</p>							

MAT FIVE YEAR PLAN
KCS PROJECT 126

FUNDING (\$000)

	PRIOR	P1	P2	P3	P4	P5
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COMPONENT -- NITROGUANICIN

(CONTINUE¹)

(4447) TITLE - ON-LINE ANALYZERS FOR NITROGUANICIN PLANT

PROBLEM - A NITROGUANICINE MFG FACILITY IS BEING CONSTRUCTED AT SUNFLOWER AAF MPT 5 TPF 4447 INDICATED THE FEASIBILITY OF AUTOMATED ON-LINE INSTRUMENTATION FOR PROCESS STREAM CHEMICAL ANALYSIS. HOWEVER THE RELIABILITY HAS NOT BEEN DEMONSTRATED.

SOLUTION - INSTALL AND EVALUATE AN ON-LINE ION CHROMATOGRAPH, A GAS CHROMATOGRAPH, AND A SPECTROPHOTOMETER IN THE NO SUPPORT EQUIPMENT WHICH IS TO BE OPERATED DURING FY&2 UNDER MPT 5 EN 4061. NO PROCESS OPTIMIZATION.

COMPONENT -- SINGLE FAKE

(4627) TITLE - SOLVENT RECOVERY/DRYING OF SINGLE BASE PROPELLANTS

PROBLEM - PRESENTLY SOLVENT RECOVERY, WATER DRY, AND AIR DRY OPERATIONS ARE ACCOMPLISHED IN 3 SEPARATE TANKS. ONE TANK IS USED FOR EACH OPERATION. THESE OPERATIONS ARE BOTH LABOR AND ENERGY INTENSIVE AND GENERALLY INEFFICIENT.

SOLUTION - COMBINE THE 3 SEPARATE OPERATIONS INTO ONE COMBINED OPERATION TO TAKE PLACE IN ONE MODIFIED SOLVENT RECOVERY TANK. THIS APPROACH WILL RESULT IN A SIGNIFICANT SAVINGS IN BOTH LABOR AND ENERGY.

COMPONENT -- SOLVENTLESS

(3711) TITLE - PROCESS FOR DEPOSITION OF PROPELLANT ON A SCFFEN SUBSTRATE

PROBLEM - NO PROCESS OR MANUFACTURE CAPACITY EXISTS FOR THE VOLUME PRODUCTION OF UNUSUAL PROPELLANT CONFIGURATION WHICH INVOLVES COATING A PLASTIC SCREEN WITH PROPELLANT. THIS CONFIGURATION IS BEING CONSIDERED FOR A NEW ANTITANK ROUND.

SOLUTION - ADAPT EXISTING FACILITIES TO MEET SAFETY AND PRODUCTION REQUIREMENTS AUTOMATING AREAS AS REQUIRED.

* C A T E G O R Y *

QUALITY CONTROL/TESTING

COMPONENT -- INSPECTION

(4103) TITLE - AUTO LINK INSPECTION EOPT SYSTEM (ALIES)

PROBLEM - CURRENT MANUAL INSPECTION METHODS FOR SMALL ARMS AMMUNITION LINKS ONLY PROVIDES FOR A SAMPLING OF LESS THAN ONE PERCENT OF OUTGOING LINKS. NON-CONFORMING LINKS CAUSE COSTLY LOADING MACHINE JAMS.

SOLUTION - THIS PROJECT WILL DEVELOP AND BUILD AN AUTOMATED LINK INSPECTION SYSTEM. THE SYSTEM WILL TEST AND INSPECT CRITICAL AND MAJOR FEATURES OF EACH M13 LINK PRODUCED.

FUNDING (\$000)

315 1010

319 542

MMT FIVE YEAR PLAN
RCS DRCNT 126

COMPONENT -- INSPECTION	FUNDING (\$000)
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(4357) TITLE - FLUX LEAKAGE INSPECTION SYSTEM FOR M463
COMPONENT -- INSPECTION

PROBLEM - THERE IS NO NONDESTRUCTIVE INSPECTION METHOD WITH FLOW DETECTION RELIABILITY ESTAB F/M463. A MAGNETIC FLUX LEAKAGE DEVICE PURCHASED FROM LOUISIANA APP DEMONSTRATED FEAS BUT COST OF OPERATION MUST BE DETERMINED.

SOLUTION - DESIGN, DEVELOP AND FABRICATE A PROTOTYPE MFL INSP SYS + EVALUATE RELIABILITY + OPERATING COST COMPARED TO ULTRASONIC INSPECTION SYSTEMS.

(4358) TITLE - AUTO LINE - PROCESS INSPECTION OF NEW EEC'S (ALPINE)

PROBLEM - INSPECTION OF FRIDGE WIRE ON ELECTRIC ELEVATORS.

SOLUTION - AUTOMATE THE TESTING TECHNOLOGY DEVELOPED BY TTT ARRAGCOM 12-7E. * ELECTROTHERMAL ANALOG RESPONSE INSPECTION OF EED'S FOR FINAL END ITEM NONDESTRUCTIVE ACCEPTANCE INSPECTION.

(4359) TITLE - IMPROVE PROCESS TECHNOLOGY FOR INSPECTION OF CLOTH

PROBLEM - REDUCE TIME AND COST OF VISUAL INSPECTION OF CLOTH USED IN PROPELLANT BAGS, FLASH REDUCERS, ACCUMULATIVE LINERS AND IGNITER PADS.

SOLUTION - IMPLEMENT EQUIP PROVEN FEASIBLE. FROCURE + INSTALLATION OF MOD STATE-OF-ART SENSORS THAT WILL MARK LOCATION OF CLOTH DEFECTS DURING SLITTING OPERATION. CLOTH WILL BE REMOVED + DISCARDED PRIOR TO SUBSEQUENT SEWING OPERATIONS.

(4471) TITLE - CONICAL SURFACE INSPECTION

PROBLEM - NO SATISFACTORY AUTOMATED INSPECTION EQUIPMENT IS KNOWN TO ACCOMPLISH THE VARIOUS CONICAL SURFACE INSPECTIONS FOR CONVENTIONAL AND ADVANCED SHAPED CHARGE LINERS.

SOLUTION - PROVIDE AN AUTOMATED INSPECTION SYSTEM COMPATIBLE WITH PROPOSED CONVENTIONAL AND SHAPED CHARGE TECHNOLOGY PROGRAMS. SPECIFICALLY FOR CONICAL SURFACE MEASUREMENTS.

COMPONENT -- NON-DESTRUCTIVE TESTING

(33719) TITLE - APPLICATION OF X-RAY SYSTEM SCANNER 100 FCI

PROBLEM - IN THE CURRENT METHOD OF TESTING THE METALLURGICAL PROPERTIES OF SHELL, DESTRUCTIVE SAMPLES MUST BE TAKEN CONTINUOUSLY IN PRODUCTION

SOLUTION - DEVELOP A RAPID AND EFFECTIVE NOT METHOD TO CONTINUOUSLY VERIFY THE TENSILE AND HARDNESS PROPERTIES OF EACH SHELL PRODUCED.

FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	-- NON-DESTRUCTIVE TESTING	FUNDING (\$000)				
		Prior	F1	F2	F3	F4
(4121) TITLE - SHELL HOLOGRAPHIC INSPECTION AND EXAMINATION LINE DEVICE	(CONTINUED)					
PROBLEM - THERE IS NO COMPLETE AUTOMATIC NON-DESTRUCTIVE INSPECTION SYSTEM FOR TESTING SHELLS AT 100 PERCENT PRODUCTION RATE.	SOLUTION - DEVELOP A PRODUCTION FLUORESCENT HOLOGRAPHIC SYSTEM TO AUTOMATICALLY INSPECT ENTIRE 155MM M483A1 MFT PROJECTILES.	561	163			
(4473) TITLE - AUTO LEAK DETECTION OF LF MUNITIONS	PROBLEM - THE CURRENT METHOD OF HEATING THE WHITE PHOSPHOROUS MUNITIONS TO CHECK FOR LEAKS IS LABOR INTENSIVE AND IS NOT UNIFORM FOR ALL ROUNDS.	609				
	SOLUTION - PROVIDE A PROTOTYPE AUTOMATED IN-LINE LEAK DETECTION SYSTEM BASED ON QUANTITATIVE FLAME PHOTOMETRY. THE SYSTEM WILL CONSIST OF TWO HEATING STAGES, A SAMPLING WHEEL, LEAK DETECTOR AND HANDLING SYSTEM.					
(4546) TITLE - AUT FGR BONDED AREAS OF 105MM MORTAR INCREMNT CONTAINERS	PROBLEM - LACK OF NON-DESTRUCTIVE TEST OR INSPECTION OF THE BONDING OF THE CONTAINER HALVES AND THE CLOSURE OF FILLING HOLE.					
	SOLUTION - DEVELOP AND EQUIPMENT FOR AUTOMATIC 100 PERCENT INSPECTION OF THE INCREMENT CONTAINER BONDED AREA. THE FEASIBILITY OF OPTICS TECHNOLOGY WILL BE INVESTIGATED FOR PRACTICALITY WHICH WILL BE FOLLOWED BY EQUIPMENT DESIGN AND FABRICATION.	175	175			
COMPONENT -- SIMULATION						
(2846) TITLE - SHOCK IMPULSE HYDROSTATIC TESTING	PROBLEM - REALISTIC ACCEPT TEST OF METALLIC CARTRIDGE CASES UTILIZES 100 SAMPLE ITEMS LOADED INTO COMPLETE FOUNDS + FIRED AT A PG. THIS TEST CONSTITUTES APPROX 40 PERCENT OF ALL REALISTIC ACCEPT TEST DONE ON ENTIRE ROUND REQUIRED TO PRODUCT ROUND.	205				
	SOLUTION - A SHOCK IMPULSE HYDROSTATIC PRESSURE TESTER DEW TO TEST COMPONENT CARTRIDGE CASE IN-PLANT W/O NEED OF ASSEMBLING INTO A FULL-UP ROUND WHILE STILL SIMULATING INTERIOR BALLISTIC FUSE WILL MINIMIZE EXPENSE OF TESTING BALLISTICALLY.					
COMPONENT -- X-RAY						
(4454) TITLE - AUTOMATIC INSPECTION DEVICE EXPLOSIVE CAST IR. SHELL	PROBLEM - THE PRESENT METHOD OF INSPECTION LOADS PROJECTILE UTILIZING A STAPCAK, RADIOGRAPHIC FILM METHOD. LABOR AND MATERIAL (FILM) ARE COSTLY. IDENTIFICATION OF CRITICAL DEFECT IS SUBJECT TO HUMAN JUDGEMENT, FATIGUE, AND FEAR.	1F5	1F5	312		
	SOLUTION - DEVELOP PROTOTYPE SYSTEM USING A MINI-COMPUTER TO ANALYZE X-RAY IMAGES TO AUTOMATICALLY ACCEPT OR REJECT GROUPS OF THE FILLED PROJECTILES. DEVELOP A PROTOTYPIC FILMLESS REAL-TIME AUTOMATIC INSPECTION SYSTEM.					

MPT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	--	TITLE	FUNDING (\$000)	FUNDING (\$000)					
				PRIOR	'81	'82	'83	'84	'85
(CONTINUED)									
(4545) TITLE - DIGITAL IMAGE AMPLIFICATION X-RAY SYSTEM			737	299					
<p>PROBLEM - EXISTING IMAGE AMPLIFICATION X-RAY DOES NOT MEET THE IMAGE QUALITY CRITERIA TO BE USED AS AN INSPECTION TOOL FOR HE MORTAR ROUNDS. FILM RADIOGRAPHY, AS CURRENTLY USED, IS LABOR INTENSIVE, TIME CONSUMING, AND SUBJECT TO HUMAN INTERFERENCE JUDGEMENT.</p> <p>SOLUTION - REPLACE WITH AN IMPROVED REAL-TIME IMAGE AMPLIFICATION SYSTEM. TECHNIQUES FOR DIGITAL IMAGE ENHANCEMENT AND ANALYSIS DEVELOPED UNDER THE AYIS PROJECT WILL BE ADOPTED.</p>									
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* C A T E C O R Y	*								
SAFETY	*								
<hr/>									
COMPONENT	--	GENERAL							
(2741) TITLE - ADVANCE LIGHTNING PROTECTION TECHNIQUES IN AAPOS			150						
PROBLEM - AS THE ELECTRONICS ADOPTED IN THE DESIGN OF AAPOS BECOMES MORE SOPHISTICATED AND COSTLY, THE NEED FOR QUICK AND RELIABLE LIGHTNING PROTECTION INCREASES.									
SOLUTION - IMMEDIATE EVALUATION OF AUSTRALIAN (E.F. AUSTRALASIA) LIGHTNING PROTECTION SYSTEM AND SUBSEQUENT STATE OF THE ART ADVANCEMENT.									
(4071) TITLE - EXPLOS PREVENTION IN DRY DUST COLLECTION SYSTEMS			268	442	200				
PROBLEM - POTENTIALLY HAZARDOUS CONDITIONS EXIST IN DRY DUST COLLECTION SYSTEMS THROUGHOUT THE MUNITION'S PRODUCTION BASE. PRESENT DATA ON DETONATION CHARACTERISTICS OF EXPLOSIVE, FUELLENT OR PYROTECHNIC DUST ARE INCOMPLETE/INADEQUATE TO IMPROVE SAFETY.									
SOLUTION - DEVELOP DATA TO ESTABLISH SAFE OPERATING PARAMETERS FOR DUST COLLECTION SYSTEMS. UTILIZE THESE DATA TO DEVELOP FAIL-SAFE COLLECTION SYSTEM DESIGNS WHICH PREVENT DUST EXPLOSIONS BY EMPLOYMENT OF PROPER VENTILATION, LIMITING IGNITION ENERGY, ETC.									
(4251) TITLE - BLAST EFFECTS IN THE MUNITIONS PLANT ENVIRONMENT			1373	359					
PROBLEM - MECI OF THE DESIGN EFFECT IS IN THE AREA OF LACE REINFORCED STRUCTURES FOR Close IN AREAS, IN EXPLOSION. WE MUST ATTEMPT TO UTILIZE COP CONSTRUCTION MATERIAL.									
SOLUTION - TO STUDY CHARACTERISTICS OF THE BLAST ENVIRONMENT AND DETERMINE THE REQUIREMENTS OF THE VARIOUS STRUCTURAL MATERIALS AND ELEMENTS SUBJECT TO THESE LOADINGS.									

MMI FIVE YEAR PLAN
RCS DRAFT 126

FUNDING (\$000)

COMPONENT	TITLE	PRIOR	61	62	83	84	85
-- LAP	(4374) TITLE - EXPLOSIVE SAFETY SHIELDS	193					
	PROBLEM - ACRYLIC MATE IS USED AS A PROTECTIVE SHIELD ON LOADING LINES WHERE LOADING OF SMALL QUANT OF HIGHLY SENSITIVE EXPLOSIVE OCCURS. NO DATA ON BLAST CAP OF THE MATE IS AVAIL + WORK MUST BE DONE ON A CASE-BY-CASE BASIS.						
	SOLUTION - DETERMINE BLAST CAP OF ACRYLIC MATE + PREP DESIGN GUIDANCE FOR FUTURE USE. TECH REPORTS FOR IFSIN GUIDANCE OF THIS TYPE OF PROTECTIVE SHIELDS WILL BE DEV TO FREQUENT CASE-BY-CASE METHOD NOW USFD.						
	(4473) TITLE - IMPROVED SAFETY OF SCALE WEIGHING EQUIPMENT	377					
	PROBLEM - ELECTRONIC CONTROLS FOR WEIGHING SYSTEMS DO NOT MEET THE NATIONAL ELECTRICAL CODE STANDARDS AND OPERATE PRESENTLY UNDER EXCEPTIONS TO THE CODE.						
	SOLUTION - SCALE TRANSDUCERS WILL BE STUDIED AND SPECIFICATIONS OF THE VARIOUS COMPONENTS WILL BE REVIEWED. COMMERCIALLY AVAILABLE COMPONENTS WILL BE CONFIGURED TO ACHIEVE AN INTRINSICALLY SAFE TRANSDUCER.						
	COMPONENT -- PROPELLANTS/EXPLOSIVES						
62	(4245) TITLE - TNT EQUIV TESTING FOR SAFETY ENGINEERING	1999	441	251			
	PROBLEM - PRESENT CRITERIA FOR BLAST RESISTANT STRUCTURES IS IN TERMS OF SURFACE BLAST OF HEMISPHERICAL TNT. IN STRUCTURAL DESIGN, TO PROTECT FROM THE OUTPUT OF OTHER ENERGETICS, THE DESIGNERS MUST HAVE DATA PERTINENT TO THE MATERIAL IN QUESTION.						
	SOLUTION - BY TESTING TO GENERATE PEAK PRESSURE AND PCS IMPULSE DATA FROM BLAST MEASUREMENTS OF HIGH ENERGY MATERIALS IS GENERATED. THESE RESULTS ARE COMPARED WITH THE BLAST OUTPUT OF HEMISPHERICAL TNT TO DETERMINE THE TNT EQUIVALENCY OF THE MATERIAL.						
	(4246) TITLE - INFLOXIVE SAFE SEPARATION AND SENSITIVITY CRITERIA	2763	720				
	PROBLEM - DATA IS REQUIRED TO UPGRAGE PROCESSES AND MATERIAL FOR THE MAXIMUM SAFETY OF PERSONNEL AND EQUIPMENT AGAINST EXPLOSION PROPAGATION.						
	SOLUTION - TESTS WILL BE DESIGNED AND CONDUCTED FOR EXPLOSIVES AND END ITEMS TO DETERMINE THE SAFE SEPARATION DISTANCE AND THE EXPLOSIVE DEPTH ON CONVEYORS.						
	(4318) TITLE - ACCUMULATIONAL EXPOSURE TO VITRATE ESTERS IN MUNITION MFG	215	450				
	PROBLEM - THE THRESHOLD LIMIT VALUE FOR NITROGLYCERIN AND OTHER NITRATE ESTERS MAY BE REDUCED FROM 0.2 ppm TO 0.02 ppm. THIS COULD INVOLVE EXTENSIVE REFLECTION OR, ALL FACILITY PROJECTS INVOLVING NC OR NITRATE ESTERS.						
	SOLUTION - UTILIZE MORE EFFECTIVE VENTILATION, OR CHEMICAL ENTRAPMENT, REMOTE AUTOMATIC OPERATIONS, DEVELOP FRACTIVE CLOTHING AND AIR RESPIRATORS.						

WPI FIVE YEAR PLAN
RCS DRAFT 126

CONVENTIONAL	PROPELLANTS/EXPLOSIVES	FUNDING (\$000)			
		F1	F2	F3	F4
(CONTINUE)					
(4457) TITLE: - PROTECTION DISTANCE FOR INFLAMMABLE MATERIALS	PROBLEM - THE EXISTING SAFETY MANUAL (AIRCRAFT 3AF5-1(G)) HAS BECOME ANTIQUATED BY RECENT ADVANCES IN WEAPONS TECHNOLOGY. THERE IS A NEED TO UPGRADE ACCIDENTAL IGNITION & SUPPRESSION CRITERIA.	200			
SOLUTION - A SERIES OF PROPAGATION SUPPRESSION CRITERIA TESTS ON VARIOUS ENERGETIC MATERIALS WILL BE CONDUCTED. THE SAMPLE CONFIGURATIONS WILL SIMULATE STAGES OF END ITEM MANUFACTURE AND ASSEMBLY.					
(4458) TITLE: - WATER DELUGE SYSTEM APPLICATION IN MUNITIONS PLTS	PROBLEM - INFORMATION ON DELUGE REQUIREMENTS FOR EXTINGUISHING FIRES FROM EXPLOSIVES + PROPELLANTS PRIOR TO THE MATERIALS PROCEEDING TO DETONATION IS NOT AVAILABLE TO THE ARMY. THIS INFORMATION CANNOT BE INTRAPOLATED BETWEEN PROPELLANTS AND EXPLOSIVES.	308	296		
SOLUTION - WATER DELUGE SYSTEMS WILL BE DEVELOPED TO EXTINGUISH FIRES FROM VARIOUS EXPLOSIVES + PROPELLANTS PRIOR TO DETONATIONS. THIS DATA WILL BE INCORPORATED INTO FIRE EXTINGUISHING MANUALS AND AFFLIED TO OLD + NEW CONSTRUCTION IN AMMUNITION PLANTS.					

*****	C A T E C O R Y				
*****	S M A L L A P M C				

CONVENTIONAL -- GENERAL					
(4459) TITLE: - TRACER SHELL JACKET IMPACT PROCESS	PROBLEM - TRACER AMMO IS MORE SENSITIVE TO BULLET JACKET DRAW QUALITY THAN STANDARD CARTRIDGE. GILDING METAL CLAD STEEL JACKET DRAW PROCESS REQUIRES IMPROVED TOOL CONTROL, EQUIPMENT AND INCREASED PROCESS SURVEILLANCE.	250			
SOLUTION - EVALUATE IMPACT PROCESS TO DETERMINE CRITICAL PROCESS PARAMETERS THAT CONTROL JACKET QUALITY. ENDEAVOR TO ESTABLISH IMPROVED TOOL DESIGN.					
(4460) TITLE: - IMPROVED STORAGE TECHNOLOGY FOR PRODUCTION MACHINE	PROBLEM - NEED TO OVERCOME DEGRADATION OF ELECTRONIC COMPONENTS + MEET RAPID REACTIVATION, OF AUTO FIN LINES PROCESS REQUIREMENTS.	421	325	335	
SOLUTION - DEVELOP PACKAGING TECHNOLOGY AND USE OF DRY NITROGEN FOR SCAMP EQUIPMENT.					

1981 FIVE YEAR PLAN
KCC DRAFT 126

FUNDING (\$000)

COMPONENT	GENERAL	(CONTINUE(1))	PRIOR	F1	F2	F3	F4	F5	FUNDING (\$000)
(4454) TITLE - COMPUTER/GRAPH TECHNOLOGY FOR SMALL CAL AMMO	PROBLEM - PRESENTLY THERE IS NO METHOD TO OPTIMIZE DESIGN OF TOOLING AND TO SELECT PROPER EQUIPMENT FOR SMALL CALIBER AMMO.	SOLUTION - INVESTIGATE POSSIBLE USE OF COMPUTER FOR OPTIMUM TOOL AND EQUIPMENT DESIGN, AND TO PREDICT PROCESS PARAMETERS AND COSTS.	300	400					269 225
(4529) TITLE - AUTOMATIC CARTRIDGE CASE HARDNESS MEASUREMENT	PROBLEM - MATERIAL MEASUREMENTS BY SAMPLING METHODS ARE INADEQUATE AND COSTLY.	SOLUTION - DIRECT EDDY CURRENT TECHNIQUE WOULD PROVIDE CONTINUOUS AND 100% INSPECTION.							145 686
COMPONENT -- METAL PARTS									
(5411) TITLE - PROCESS F/20MM TUBULAR FIGU FAIR DEFENSE	PROBLEM - HIGH VOLUME PRODUCTION PROCESS DOES NOT EXIST FOR METAL PARTS, LOAD ASSEMBLE AND PACK.	SOLUTION - DEVELOP PRODUCTION PROCESS.							148
(4454) TITLE - DIP SPIN ZINC COATING FOR SMALL CALIBER CASES	PROBLEM - CURRENT FINISHING PROCESS FOR BUSHMASTER STEEL CASES CONSISTS OF ZINC ELECTROPLATING. CHROME CONVERSION COATING, POLYAMIDE TOPCOATING, AND WASTE TREATMENT TO CONTROL HAZARDOUS CYANIDES AND HEAVY METAL POLLUTANTS	SOLUTION - ESTABLISH THE ELECTROLESS ZINC COATING PROCESS WHICH CONSISTS OF IMMERSING CLEAN CASES IN A WATER DISPERSSION OF ZINC FLAKES, CHROMATES AND SOME SOLVENT. THE PARTS ARE THEN SPUN AND BAKED. NO POLLUTANTS ARE GENERATED							340
(4454) TITLE - WELDED OVERLAY ROTATING END WASH F/SC MUN 20MM - 40MM PROJECTILES.	PROBLEM - HIGH SPEED WELDING MACHINES FOR ROTATING ROUNDS DO NOT EXIST FOR 20MM - 40MM PROJECTILES.	SOLUTION - DEVELOP WELDING MACHINES.							170
(4443) TITLE - MACHINING OF SPARE CARTRIDGE CASES	PROBLEM - TOTAL MORTALITY TO MACHINE FACTORY GROOVE IS EXCESSIVE AND PRODUCES GREAT DEAL OF SCRAP. ALSO HEAVING COMPACT IS A PROBLEM.	SOLUTION - FIND ALTERNATIVE DESIGN FOR CUTTING TOOLS. INVESTIGATE NEW WAYS TO HOLD COMPACT IN PLACE.							

MAT FIVE YEAR PLAN
RCS TRC/T 126

FUNDING (\$000)

COMPONENT	TITLE	PROBLEM	SOLUTION	F10K	F1	F2	F3	F4	FUNDING (\$000)
(3214) 5.56 - .30 CAL	5.56 - .30 CAL	PROBLEM - EVALUATE EQUIPMENT FOR MULTIPRODUCT PRODUCTION. MOST LIKELY CANDIDATE IS M2CO BLANK.	SOLUTION - ESTABLISH A PROCESS FOR PLANK CAST MANUFACTURING ON SCAMP EQUIPMENT. INCLUDE INVESTIGATION OF KNURLING AND ANNEALING PROCESS REQUIREMENTS.	264	269				
(3215) 7.62MM BULLET MFG BY ROLL FORMING	7.62MM BULLET MFG BY ROLL FORMING	PROBLEM - METHOD TO MANUFACTURE 7.62 UTILIZES SAME PROCESS AS 5.56. IT IS UNCERTAIN WHETHER IT WILL WORK IN 7.62.	SOLUTION - INVESTIGATE OTHER METHODS OF PRODUCING 7.62 BULLET ROLL FORMING APPEARS VERY PROMISING.	260					
(3216) IMPROVED TECH FOR SMALL CALIBER AMMUNITION	IMPROVED TECH FOR SMALL CALIBER AMMUNITION	PROBLEM - THE SMALL ARMS MUNITION PRODUCTION BASE MUST KEEP AHEAD OF THE RAPIDLY EMERGING NEW MANUFACTURING TECHNIQUES ON A COST/PRODUCTIVITY BASIS.	SOLUTION - CONTINUALLY MONITOR THE SMALL ARMS DEVELOPMENTS AND APPLICABLE EMERGING MANUFACTURING TECHNOLOGY.	500	1000				
(3217) MODERNIZED PROCESSES FOR MANUFACTURE OF NATO 5.56MM AMMO	MODERNIZED PROCESSES FOR MANUFACTURE OF NATO 5.56MM AMMO	PROBLEM - AN AMERICANIZED VERSION OF FELGIUM SS-109 WILL BE USED IN THE SAW SYSTEM. THIS EFFORT IS DIRECTED TOWARD DEVELOPMENT OF CONVENTIONAL PROCESSES TO MASS PRODUCE SAW'S AMMUNITION ON SCAMP EQUIPMENT.	SOLUTION - THIS PROJECT WILL DEFINE PROCESSES AND EQUIPMENT/TOOLING CHANGES REQUIRED ON SCAMP LINE. INITIATION OF THESE EFFORTS THIS YEAR WILL PROVIDE PROCESS EQUIPMENT SPECIFICATIONS FOR IMPLEMENTATION IN SUFFICIENT TIME TO MEET FY87 AND ON REQUIREMENTS.	800					
(3218) MANUFACTURING PROCESSES FOR 9MM AMMUNITION	MANUFACTURING PROCESSES FOR 9MM AMMUNITION	PROBLEM - ONLY LIMITED COMMERCIAL CAPACITY EXISTS TO PRODUCE 9MM AMMUNITION. THERE ARE NO GO CO LINES TO SATISFY ANTICIPATED MILITARY REQUIREMENTS.	SOLUTION - DEVELOP A PROCESS FOR PRODUCTION OF 9MM AMMUNITION UTILIZING AN IN-LINE TRANSFER PRESS FROM A PROTOTYPE 5.56MM LINE. ONE MILLION PARTS WILL BE PRODUCED AND TESTED FOR PROCESS VERIFICATION.	235	150				

MMT FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$UFO)

COMPONENT	TITLE	FRIOR	E1	E2	E3	E4	E5
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(41-C) TITLE -- 5.56MM - .30 CAL
(CONTINUE!)

PROBLEM - NEW MFG PROCESSES FOR SMALL CAL PENETRATORS

926 211

SOLUTION - INVESTIGATE SKEWED AXIS ROLL FORMING OF PENETRATOR AS WELL AS HYBRID SLICES MANUFACTURING AND FEEDING METHODS. COLD HEADING WILL ALSO BE EVALUATED.

(45-3) TITLE - NEW PROCESS FOR SAWs TRACER AMMUNITION

500 129

PROBLEM - THERE IS NO U.S. CAPABILITY FOR MANUFACTURING THE PROPOSED NATO 5.56MM TRACER BULLET IN THE QUANTITIES REQUIRED FOR THE SAW SYSTEM.

SOLUTION - THE CONVENTIONAL SMALL CALIBER TRACER BULLET MANUFACTURING EQUIPMENT WILL BE MODIFIED TO PRODUCE THE NATO TRACER BULLET.

(45-6) TITLE - 5.56MM CARTRIDGE LINKING SYSTEM

558 577

PROBLEM - THERE ARE CURRENTLY NO LINKING MACHINES AVAILABLE FOR LINKING PRODUCTION QUANTITIES OF 5.56MM AMMUNITION. THE MANUAL AND SEMI-MANUAL METHODS AVAILABLE ARE SLOW AND COSTLY.

SOLUTION - LINKING MACHINES FOR 7.62MM AMMUNITION DO EXIST. A MODIFICATION AND IMPROVEMENT SHOULD PROVIDE A SATISFACTORY SOLUTION. A PRODUCTION RATE OF 65.0 MILLION ROUNDS PER YEAR IS REQUIRED.

(46-6) TITLE - MANUFACTURE OF FRANGIBLE TRAINING AMMUNITION

386 170

PROBLEM - FRANGIBLE BULLET (4160) WAS DEVELOPED IN MIL-1540-S. AN EFFORT IS REQUIRED TO EXPLORE PROCESSES TO ACHIEVE A LOW COST PRODUCTION CAPABILITY.

SOLUTION - DEVELOP APPROPRIATE PROCESS EQUIPMENT FOR PRODUCTION OF QUALITY PROJECTIONS. THE PROTOTYPE AND PROCESS DEVELOPMENT EFFORT WILL ESTABLISH COST-EFFECTIVE TECHNOLOGY FOR EFFECTIVE MANUFACTURE, CARTRIDGE, ASSEMBLY, AND MATERIAL HANDLING TECHNIQUES.

(46-8) TITLE - 5.56MM SAWs LINK ORIENTED AMMUNITION SYSTEM

406

PROBLEM - THE 27 LINKS ARE MANUALLY ORIENTED AND PACKED AT THE LINK MANUFACTURERS. AT THE LOADING PLANT, LINKS MUST BE MANUALLY UNPACKED AND FIT INTO THE LINKING MACHINE. WHICH IS TIME CONSUMING AND COSTLY.

SOLUTION - BY DEVELOPING RANDOM ORIENTING EQUIPMENT, THE LINK MANUFACTURERS WILL BE ABLE TO SHIFT LINKS IN FROM THE MANUFACTURING PLANT; THUS, ELIMINATING MANUAL UNPACKING AND FITTING INTO THE MACHINE.

SIXTH FIVE YEAR PLAN
PCG, DRAFT 126

COMBINATION -- 5.56MM - .30 CAL
CONTINUED)

(4541) TITLE - AUTO PRIMER INSERT LACQUER AND ANVIL PRESENCE INSPECT SYS

PROBLEM - LACQUER INSPECTION AT USE IS WHICH IS BEING ELIMINATED. THE PRIMER INSERT SUBMODULE CURRENTLY IS EFFECTS FOR PRIMER ANVIL WITH A PROBE. TO IMPROVE EFFICIENCY, A BACK-UP INSPECTION IS DESIRED CAPABLE OF BEING INSTALLED ON EXISTING EQUIPMENT.

SOLUTION - A FLUORESCENT CYE WILL IF ADDED TO THE PRIMER LACQUER TO BE DETECTED BY TWO DETECTORS. THE BACK-UP INSPECTION OF PRIMER ANVIL WILL BE EVALUATED BY USING A NON-CONTACT EDDY CURRENT PROBE.

(4542) TITLE - MFG PROCESS PARAMETERS FOR .50CAL/5.56MM AMMO

PROBLEM - THE ARMY IS DEVELOPING A PRODUCTION BASE FOR THE NATO 5.56MM AMMUNITION. HOWEVER, THERE IS NO PROCESS WHICH U.S. PRODUCED ROUNDS CAN BE FERVEN OUT FOR ACCEPTABILITY OF PERFORMANCE OR THE SUITABILITY OF THE MANUFACTURING TOOLING AND PROCESSES.

SOLUTION - PURCHASE QUANTITIES OF 20MM AMMUNITION FROM LCAAP PRODUCED BY THE NEWLY DEVELOPED PROCESS AND TDP FOR TECHNICAL EVALUATION AND PRODUCT TOOLING ACCEPTABILITY.

COMPONENT -- .50 CAL 410 LAPGE

(4543) TITLE - HOT FORMING CF P/M PROJ CFCIS

PROBLEM - CURRENT METHODS OF FABRICATING CANNON CALIBER ROUNDS REQUIRES EXTENSIVE MACHINING TO REMOVE 16-70 PERCENT OF THE STARTING MATERIAL.

SOLUTION - FABRICATE PROJECTILE BURIED BY UTILIZING FOUNDRY METALLURGY (P/M) HOT FORMING INTO THE DESIRED SHAPE.

(4544) TITLE - PRODUCTION PROCESS FOR CALIBER .50 PLASTIC BLANK AMMUNITION

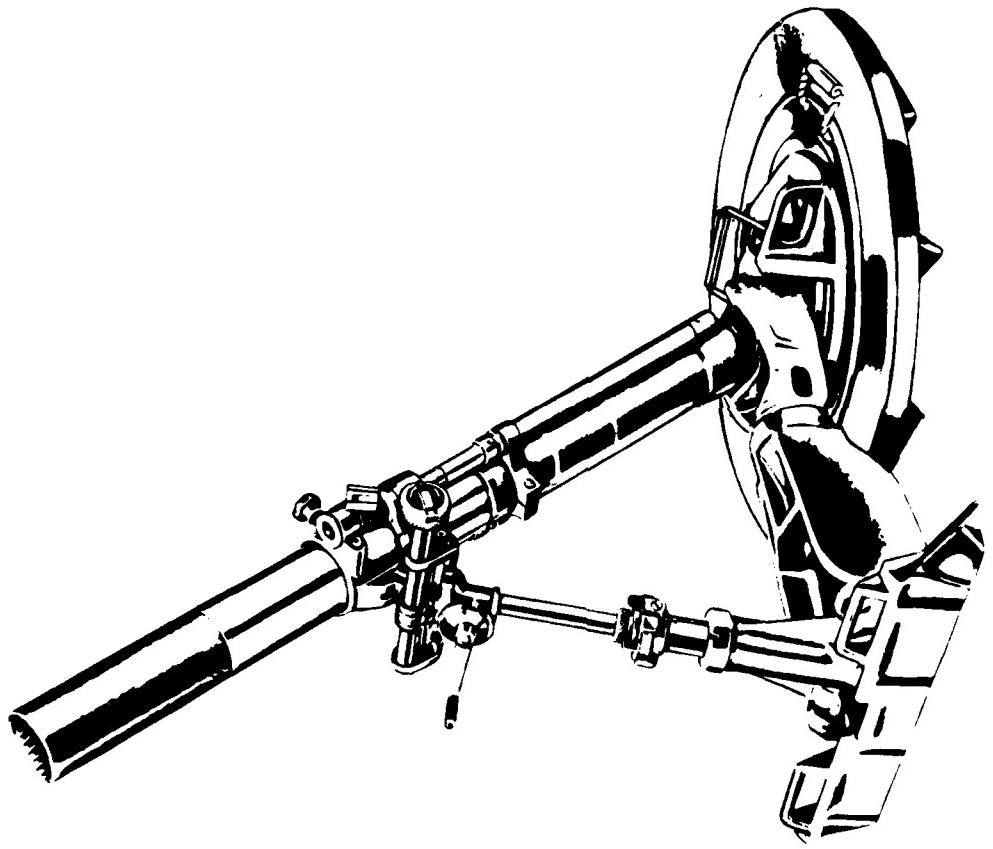
PROBLEM - CURRENTLY, THERE IS NO PRODUCTION EQUIPMENT FOR MANUFACTURING (.50 METAL BASED ASSEMBLY, PRIMING, AND LOADING. MOLTING, DIES AND OTHER TOOLING WILL BE DESIGNATED, CONSTRUCTED, AND TESTED TO PROVE OUT SLELCTED PROCESS.

(4545) TITLE - MANUFACTURE EQUIPMENT FOR .50 CALIBER BLANK AMMUNITION

PROBLEM - THE EXISTING EQUIPMENT IS OF HIGH VINTAGE, LOW RATE, AND LABOR INTENSIVE. IN ADDITION, IT REQUIRES PLATES AND LEADERS IN THE PRESENT CAPACITY.

SOLUTION - EVALUATION WILL BE MADE ON EXISTING SYSTEMS - THE - ACT FOR THE MANUFACTURE AND INSPECTION OF THE PLATES AND LEADERS. THE PLATES AND LEADERS ARE PROTOTYPED REQUESTED SYSTEM WITH THE CONCERN OF THE PLATE MATERIAL.

	FUNDING (\$000)				
	PRIOR	'81	'82	'83	'84
(4541) TITLE - AUTO PRIMER INSERT LACQUER AND ANVIL PRESENCE INSPECT SYS	565	245			
(4542) TITLE - MFG PROCESS PARAMETERS FOR .50CAL/5.56MM AMMO	517				
(4543) TITLE - HOT FORMING CF P/M PROJ CFCIS	170				
(4544) TITLE - PRODUCTION PROCESS FOR CALIBER .50 PLASTIC BLANK AMMUNITION	300	400			
(4545) TITLE - MANUFACTURE EQUIPMENT FOR .50 CALIBER BLANK AMMUNITION	300	700	400		



**ARMAMENT R&D COMMAND
ARMAMENT MATERIEL READINESS COMMAND
(ARRADCOM, ARRCOM)
(WEAPONS)**

<u>CATEGORY</u>	<u>EXPLANATION</u>
Fire Control-----	10
General Manufacturing-----	12
Large Caliber-----	22
Pollution Abatement-----	67
Quality Control/Testing-----	10
Small Caliber-----	49

WEAPONS PROGRAM

The US Army Armament Materiel Readiness Command (ARRCOM), headquartered at Rock Island, IL, has responsibility for MMT projects on weapons in full scale production. ARRADCOM is responsible for MMT projects for weapons in development or initial production. Most of the weapons projects are performed through Watervliet Arsenal (WVA) and Rock Island Arsenal (RIA). The main emphasis of the weapons MMT program is the modernization and upgrading of operations through the REARM program. The purpose is to reduce costs and improve product quality by taking advantage of the advances in metalworking technology.

Many of the projects planned for FY81-85 at Watervliet Arsenal are related, in whole or in part, to the handling and fixturing of cannon tubes and their components. Since many items produced at Watervliet are large, complex and/or require close tolerances, the setup and movement time are important cost drivers.

A major cost driver at WVA is metal removal. Since the alloys used in weapons are expensive and difficult to work, producing components close to final shape will reduce the cost and time required for finishing. Methods being explored include hot isostatic pressing (HIP) and powder metallurgy (PM). Projects are also proposed to improve the metal removal process. High speed metal removal is addressed in several projects as are efforts proposed to perform multiple operations at one time. Some of the other areas in the Watervliet submission include group technology, computer-aided manufacturing, non-traditional surface hardening methods, chromium plating, and finding substitutes for critical materials.

Cost reductions and productivity increases in manufacturing continue to be the prime objectives of MMT at Rock Island Arsenal. Because RIA is a job-shop organization, administration and planning overhead is a significant cost driver. By developing an integrated computer-aided manufacturing/management information system the Arsenal will be able to efficiently control all operations from receipt of an order to delivery of the product. Some of the management areas addressed include process modeling, performance measurement, computer-aided work measurement system, and online production information system. Cost benefits are also expected from improved material handling and in-process control projects which are tied into the overall CAM/MIS effort at RIA. Efforts in this area include robot loading of machines, and automated process control.

Since RIA's task is primarily metalworking, there are several projects included in this area. While all efforts will in themselves reduce costs, coupling with the Arsenal's overall CAM/MIS will further increase the benefits. Some of the areas covered include casting, welding, and electro-chemical grinding.

Minimizing energy consumption and pollution during manufacturing is a national priority and an important part of RIA's MMT submission. Areas being studied include heat recovery, and optimized heat treatment processes. As anti-pollution requirements become more stringent, it is necessary for manufacturers to improve their environmental posture while maintaining a competitive position or face close down by economic or legal factors. Rock Island Arsenal's MMT submission will correct present environmental difficulties and help prevent future ones so that the Arsenal's vital defense role will not be jeopardized.

Improved metalworking methods and increased use of computer-aided manufacturing are major production trends and the results of the projects in this submission are expected to hold significant interest for other producers, both Government and non-government. These projects will also be of importance in the modernization and upgrading of the facilities of weapons contractors, many of which are seriously outdated.

ARRCOM
COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
FIRE CONTROL	1200	1960	2223	3105	1492
GENERAL MANUFACTURING	2003	2363	4737	7220	4764
LARGE CALIBER	2716	4998	5042	6367	5750
POLLUTION ABATEMENT	0	0	0	0	130
QUALITY CONTROL/TESTING	80	190	1108	779	678
SMALL CALIBER	1083	1222	1721	1764	3025
TOTAL	7082	10733	14831	19235	15839

* C A T E G O R Y *
* FILE CONTROL *

WT FIVE YEAR PLAN

KCS ERMT 126

PRIOR P1 P2 P3 P4 P5

FUNDING (\$000)

450 470

450

COMPONENT -- ASSEMBLIES

(8321) TITLE - EXPANDED APPLICATION OF ADHESIVE BONDING TO F.C. ASSEMBLY

PROBLEM - CURRENT ASSEMBLY METHODS DO NOT TAKE FULL ADVANTAGE OF THE MANY ADVANCED ADHESIVE SYSTEMS AVAILABLE. MANY OPERATIONS COULD BE CONVERTED WITH SIGNIFICANT SAVINGS IN BOTH TIME AND MONEY AND WITH INCREASED RELIABILITY.

SOLUTION - SELECT A SERIES OF ASSEMBLY OPERATIONS AS CANDIDATES FOR ADHESIVE BONDING. DESIGN BONDING SYSTEMS, APPLY, TEST AND EVALUATE. PREPARE PROCESS SPECIFICATIONS FOR THE SUCCESSFUL SYSTEMS.

COMPONENT -- GENERAL

(7966) TITLE - PRODUCTION ENGINEERING FCF TRITIUM RADIOLUMINESCENT LAMPS

PROBLEM - CURRENT METHODS OF CONTROLLING MOISTURE CONTENT, SEALING AND ALUMINIZING TRITIUM LAMPS ARE PERCEIVED RESPONSIBLE FOR THE PRESENT LACK OF DEFENDABILITY.

SOLUTION - DETERMINE THE PRODUCTION CONDITION THAT WILL RESULT IN OPTIMUM HALF-BRIGHT LIFE AND MODIFY CURRENT PRODUCTION METHODS ACCORDINGLY.

(8061) TITLE - NEAR MILLIMETER WAVE ANTENNA FABRICATION

PROBLEM - THERE IS A GROWING REQUIREMENT FOR RADAR SYSTEMS OPERATING AT WAVELENGTHS OF APPROXIMATELY 3 MILLIMETERS. A KEY COMPONENT IS THE ANTENNA. MANUFACTURING THESE TO REQUIRED TOLERANCES IS DIFFICULT AND COSTLY.

SOLUTION - REPLICATING TECHNIQUES SIMILAR TO THOSE USED IN OPTICAL MFG WILL BE EVALUATED. PROTOTYPE WILL BE FABRICATED AND TESTED. THE PROCESS WILL BE EVALUATED FOR PROD SUITABILITY.

(8263) TITLE - PROB. IN-PROCESS INSPECT EQUIP FOR LASER RANGE FINDER CHARS

PROBLEM - CURRENT PRODUCTION/IN-PROCESS INSP. TECHNIQUES ARE REJECTING GOOD LASER RANGE FINDERS. THE REJECTION OF GOOD LRF IS ATTRIBUTED TO INACCURACIES OF RADIOMETERS AND INCANDESCENT LIGHT SOURCES USED TO MEASURE THE LASER POWER OUTPUT AND SENSITIVITY.

SOLUTION - ADVANCES IN ELECTRO-OPTICAL TECHNOLOGY, DIGITAL RADIOMETERS AND CALIBRATED SOLID STATE LIGHT SOURCES WILL BE USED TO CORRECT CURRENT INSP. INACCURACIES.

(8327) TITLE - COMPUTER AIDED ENGINEERING (CAE) TECHNIQUES F/FC

PROBLEM - MANUFACTURING METHODOLOGIES AND THE APPLICATION OF CAD AND CAM TO FC MANUFACTURING HAS ONLY PRODUCED ISOLATED IMPROVEMENTS AND MANY OF THE MAJOR PROBLEMS STILL PERSIST.

SOLUTION - A SYSTEMS APPROACH WITH COMPUTER INTEGRATED MANUFACTURING METHODOLOGIES TO ESTABLISH A CLOSED LOOP SYSTEM FOR THE DESIGN-THROUGH MANUFACTURING PROCESS FOR FC, INCLUDING PLANNING, ENGINEERING, GA, AND DECISION MAKING.

MMT FIVE YEAR PLAN
RCS DRCT 126

(CONTINUED)

COMPONENT	-- GENERAL	FUNDING (\$000)				
		PRIOR	81	82	83	84
(8363) TITLE	- DISTRIBUTED NETWORK FOR FIRE CONTROL MANUFACTURING	300	300	200		
PROBLEM	- NO PROBLEM PROVIDED BY ARRADCOM.					
SOLUTION	- NO SOLUTION PROVIDED BY ARRADCOM.					
COMPONENT	-- OPTICS					
(7627) TITLE	- PROGRAMMED OPTICAL SURFACING EQUIP AND METHODOLOGY-CAM	395	126			
PROBLEM	- CURRENT TECHNIQUES FOR PITCH BUTTIONING AND PLUCKING PRECISION LENSES USE OLDER CONVENTIONAL EQUIP. ACCURACY DEPENDS ON THE SKILL AND EXPERIENCE OF WELL TRAINED MASTER CFTICIAN WHO ARE BECOMING SCARCE.					
SOLUTION	- ADAPT COMPUTER TECHNIQUES AND INSTRUMENTATION WITH CONTROLS TO PITCH BUTTIONING AND PLUCKING OPERATIONS. THE END PRODUCT WILL BE AN INTEGRATED SURFACING SYSTEM IMPLEMENTED IN THE FIRE CONTROL FABRICATION FACILITY AT ARRADCOM.					
(8043) TITLE	- IMPROVE MFG TECH AND QUL OF OPTICAL SCRATCH AND DIG STAND	185	266			
PROBLEM	- PRESENT OPTICAL SCRATCH AND DIG STANDARDS ARE DIFFICULT AND EXPENSIVE TO MANUFACTURE, CALIBRATE, AND MAINTAIN					
SOLUTION	- ESTABLISH STANDARD MFG METHODS AND EQUIPMENT FOR EFFICIENTLY PRODUCING IMPROVED OPTICAL SCRATCH AND DIG STANDARDS. VALIDATE THE IMPROVED MFG TECHNIQUES.					
(8046) TITLE	- HIGH SPEED FABRICATION OF ASPHERIC OPTICAL SURFACES					
PROBLEM	- THE HULK OF THE COST OF OPTICS FOR FIRE CONTROL SYSTEMS LIES IN THE FIGURING AND POLISHING STAGE.					
SOLUTION	- USE THE TURBULAR TOOL GRINDING PROCESS TO PRODUCE ASPHERIC SURFACES DIRECTLY DURING THE GRINDING PROCESS					
(818) TITLE	- THERMOGRAPHIC EVALUATION OF OPTIC BANDS					
PROBLEM	- THE BOND BETWEEN OPTICAL ELEMENTS AND THEIR STRUCTURAL SUPPORTS MUST BE FREE OF VOLES. OF WHICH THICKNESS AND OF SUFFICIENT STRENGTH TO HOLD FAST AND MAINTAIN ALIGNMENT UNDER SEVRE SHOCK.					
SOLUTION	- INTRODUCE THERMOGRAPHIC PROCEDURES TO THE INSPECTION OF OPTICAL BANDS.					

MIL FIVE YEAR PLAN
RCS DRAFT 126

FUNDING (\$000)

COMPONENT	--- OPTICS	FRIOR	81	82	83	84	85
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(CONTINUEE)

(8165) TITLE - STANDARDS FOR DIAMOND TURNED OPTICAL PARTS

PROBLEM - EXISTING SURFACE FINISH STANDARDS AND TESTING EQUIPMENT AND TECHNIQUES DO NOT COVER THE RANGE OF DIAMOND TURNED OPTICAL SURFACES FOR A PRODUCTION ENVIRONMENT (1/2 TO 1 MICROINCH).

SOLUTION - CORRELATE LASER SCATTEROMETRY AND INTERFERENCE CONTRAST MICROSCOPY WITH FUNCTIONAL OPTICAL TESTING TO OPTIMIZE THE SPECIFICATION OF THE SURFACE WITH A MEASUREMENT TECHNIQUE FOR A PRODUCTION ENVIRONMENT.

(8219) TITLE - PILOT PRODUCTION OF GRADIENT INDEX OPTICS

PROBLEM - GRADIENT OPTICS, WHERE IN THE INDEX OF GLASS IS SEQUENTIALLY VARIED TO OBTAIN DESIGNED OPTICAL CHARACTERISTICS IS FAR MORE DESIRABLE THAN CURRENT USED, I.E., FORMING A CURVE ON THE GLASS SURFACE.

SOLUTION - ESTABLISH SUBSEQUENT TO MILITARY USE, A PILOT PRODUCTION FACILITY TO MANUFACTURE GRADIENT OPTICS TO MILITARY USE, A PILOT PRODUCTION FACILITY TO MANUFACTURE GRADIENT OPTICS AT A REQUIRED RATE.

(8211) TITLE - NET SHAPE OPTICAL PROCESSING

PROBLEM - CONSIDERABLE TIME AND EFFORT IS REQUIRED TO PROCESS AN OPTIC FROM A RAW PRESSING TO ITS FINAL SHAPE.

SOLUTION - IMPROVE OPTICAL PRESSING TECHNIQUE TO ACHIEVE NEAR NET SHAPES IN THE INPUT PLANK.

(8261) TITLE - BONDING OF EPOXY RESIN ADHESIVE SYSTEM

PROBLEM - A RELIABLE AND EFFICIENT PROCEDURE FOR PRODUCTION AND DEPOL MAINTENANCE LEAVING OF GLASS TO METAL MIL-A-4661 JUNCTIONS DOES NOT EXIST.

SOLUTION - CONVERT DEMONSTRATED LABORATORY DEENCODING TECHNIQUES TO PRODUCTION/INPUT REPAIR PROCEDURE THAT WILL BE INCLUDED IN MIL-A-4661. THIS PROCEDURE WILL ALLOW FOR THE RECOVERY OF EXPENSIVE OPTICAL ELEMENTS AND THEIR REUSE.

(8262) TITLE - PRODUCTION METHODS FOR OPTICAL WAVE GUIDES

PROBLEM - MANUFACTURE OF INTEGRATED WAVEGUIDES IS COMPLICATED AND TIME CONSUMING INVOLVING PROCESSES RELATED TO METHODS USED TO MAKE SEMICONDUCTOR INTEGRATED CIRCUITS.

SOLUTION - USE ION IMPLANTATION TO ALTER OPTICAL PROPERTIES OF GALLIUM ARSENIDE AND PHOSPHIDE SUBSTRATES TO DIRECTLY FORM OPTICAL WAVEGUIDES IN A ONE-STEP PROCESS.

(8263) TITLE - RADIAL GRADIENT INDEX OPTICS

PROBLEM - NO PROCESS PROVIDED BY AFACCOM.

SOLUTION - NO SITUATION PROVIDED BY AFACCOM.

MMI FIVE YEAR PLAN
ECS ERCHT 126

FUNDING (\$000)

COMPONENT -- OPTICS

(CONTINUED)

(6467) TITLE - DIAMOND POINT TURNING OF GLASS OPTICS

PROBLEM - NO PROBLEM PROVIDED BY ARRALCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.

* C A T E G O R Y *

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*GENERAL MANUFACTURING *

COMPONENT -- EQUIPMENT

(7417) TITLE - LASER WELDING TECHNOLOGY FOR WEAPON COMPONENTS

PROBLEM - CONVENTIONAL WELDING AND OTHER JOINING METHODS YIELD JOINTS WHICH ARE UNSUITABLE IN CERTAIN HIGH STRESS APPLICATIONS.

SOLUTION - LASER WELDING CAN PRODUCE ACCEPTABLE JOINTS.

(8154) TITLE - COMPUTER INTEGRATION MFG (CIM) - DONG

PROBLEM - NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.

SOLUTION - INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE CNC TECHNOLOGY.

(8227) TITLE - ROBOT LOADING OF NC MACHINES

PROBLEM - ALTHOUGH MODERN NUMERICALLY CONTROLLED MACHINES CAN MACHINE MANY PARTS WITH VIRTUALLY NO OPERATOR ATTENTION, OPERATORS ARE STILL REQUIRED TO LOAD AND UNLOAD THE MACHINES.

SOLUTION - DESIGN FIXTURES AND PLANS (IF MACHINES THAT CAN BE LOADED AND UNLOADED BY A PROGRAMMABLE ROBOT FOR JOB SHOP OPERATION DESIGN THE SYSTEM SO ONE ROBOT CAN LOAD SEVERAL MACHINES WHICH ARE MACHINING DIFFERENT PARTS.

(P354) TITLE - APPLICATION OF NC WELDING (CAP)

PROBLEM - ALTHOUGH RIA IS A JOB SHOP, MANY MANUFACTURED ITEMS SUCH AS THE M140 GUN MOUNT, M45 RECOIL MECHANISM, ETC., HAVE PRODUCTION LIFE SPANS OF MANY YEARS. FOR THESE ITEMS, NC WELDING WILL PROVE MORE ECONOMICAL AND PROVIDE BETTER QUALITY.

SOLUTION - APPLY NC WELDING TO LONG RUN PRODUCTION PARTS. ON APPLICABLE ITEMS, NC WELDING WILL PROVIDE BETTER EFFICIENCY, EASIER FINAL MACHINING OF THE WELDMENT, REDUCED WELDING TIMES, AND REDUCE THE AMOUNT OF COSTLY WELDING CERTIFICATION REQUIRED.

PRIOR 81 82 83 84 85

150 600 500

750 400 400

FIVE YEAR PLAN
RCS DRAFT 196

COMPONENT -- EQUIPMENT

(84-4) TITLE - ELECTRIC CONTROL OF ARC WELDING

(CONTINUE[])

PROBLEM - THE REPAIR OF DEFECTIVE WELDS ARE FREQUENTLY EXPERIENCEU. REPAIR REQUIREMENTS ARE OFTEN TRACED TO THE SKILL LEVEL OF THE WELDING OPERATORS.

SOLUTION - ADAPTIVE CONTROLS ARE BEING USED IN AN INCREASING NUMBER OF WELDING APPLICATIONS TO DEEMPHASIZE OPERATOR'S SKILL IN MAKING CONSISTENT PRODUCT. SUCH FEEDBACK CONTROL ROBOTS SHOULD BE USED ALSO IN WEAPONS FABRICATION.

(85-6) TITLE - ROTATION METHODS OF FRICTION WELDING

120

PROBLEM - ROTATIONAL FRICTION WELDING IS CONFINED TO APPLICATIONS IN WHICH AT LEAST ONE OF THE TWO PIECES TO BE JOINED HAS A CIRCULAR OR NEAR-CIRCULAR CROSS SECTION.

SOLUTION - NON-ROTATION FRICTION WELDERS SUCH AS CRISTAL AND OSCILLATORY TYPES ARE NOW AVAILABLE WHICH OVERCOME RESTRICTIONS IN SHAPE.

COMPONENT -- INFORMATION SYSTEM

(81-1) TITLE - LOWEST COST COMPUTER SYSTEM FOR FOUNDRY (CAM)

PROBLEM - PRESENT METHODS OF DETERMINING THE CHARGE FOR PARTICULAR ALLOYS DO NOT ALLOW FOR THE MOST EFFICIENT USE OF RAW MATERIAL.

SOLUTION - DESIGN AND INSTALL A COMPUTERIZED LINEAR PROGRAMMING MODEL THAT WILL SELECT RAW MATERIALS, INCLUDING SCRAP, TO PROVIDE THE LOWEST COST CHARGE FOR THE DESIRED ALLOY.

(81-2) TITLE - PERFORMANCE MEASUREMENT PARAMETERS FOR GOGO MFG.

PROBLEM - MEASURING THE PERFORMANCE OF A GOVERNMENT MANUFACTURING OPERATION IS DIFFICULT. GOGO OPERATIONS, ALTHOUGH FINANCIALLY COMPETITIVE, ARE NOT IN A FULLY COMPETITIVE MARKETPLACE. ACCOUNTING DATA BY ITSELF IS NOT SUFFICIENT TO MEASURE PERFORMANCE.

SOLUTION - DEVELOP A SERIES OF MEASUREMENTS THAT COUPLE ACCOUNTING DATA AND PRODUCTION DATA TO ACCURATELY ASSESS PERFORMANCE. INCLUDE DATA ON TECHNOLOGICAL IMPROVEMENTS, INFLATION, PRODUCT COST, ETC. MEASUREMENTS WILL BE USEFUL IN LONG RANGE PLANNING.

(82-6) TITLE - COMPUTER AIDED WORK MEASUREMENT SYSTEM (CAM)

PROBLEM - TIME STUDIES AND USE OF STANDARD DATA PRESENTLY REQUIRE TIME CONSUMING MANUAL CALCULATIONS TO DEVELOP PRODUCTION STANDARDS.

SOLUTION - DEVELOP A COMPUTERIZED WORK MEASUREMENT SYSTEM THAT WILL VIRTUALLY ELIMINATE MANUAL CALCULATIONS IN THE DEVELOPMENT OF PRODUCTION STANDARDS. ROUTINES WILL INCLUDE PROGRAMS TO DEVELOP FINISHED STANDARDS FROM RAW TIME STUDIES, OR STANDARD DATA.

FUNDING (\$000)

FRYOK	81	82	83	84	85
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400 300

124

20F

MAT FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	-- INFORMATION SYSTEMS	(CONTINUED)	FUNDING (\$000)				
			PRIOR	E1	E2	E3	E4
(635) TITLE - INTEGRATED MANUFACTURING SYSTEM (CIMAM)			2575	3025			
PROBLEM - MIS'S ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MANUFACTURING ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILITY, LABOR AND MATERIALS.							
SOLUTION - DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT FIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO DELINATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.							
(836) TITLE - ON-LINE PRODUCTION INFORMATION SYSTEM (CAMP)			360	300			
PROBLEM - THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM. MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING, TIME SCHEDULING, GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.							
SOLUTION - DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.							
COMPONENT	-- MISCELLANEOUS						
(7545) TITLE - HEAT RECOVERY FROM MANUFACTURING PROCESSES			150				
PROBLEM - LARGE AMOUNTS OF ENERGY ARE WASTED IN MANUFACTURING PROCESSES, E.G., HEAT TREATING, FORGING, SURFACE TREATMENT, AND CASTING.							
SOLUTION - ANALYZE ENERGY CONSUMPTION RELATED TO THESE MANUFACTURING PROCESSES TO DETERMINE AREAS WHERE HEAT CAN BE ECONOMICALLY RECOVERED. DESIGN, INSTALL, AND PROVE OUT HEAT RECOVERY DEVICES WHERE ECONOMICAL.							
(PC00) TITLE - MANUFACTURING GUIDE FOR ELASTOMERIC SEALS							
PROBLEM - CONSTANT PROBLEMS IN THE PROCUREMENT OF SATISFACTORY SEALS FOR WEAPONS SYSTEMS, I.E., M140, M127, ETC., ARE EXPERIENCED WITH RESULTANT SOURCE PURCHASES.							
SOLUTION - ELIMINATE SOLICIT SOURCE PROCUREMENT BY DOCUMENTING PROCESSING TECHNIQUES AND FORMULA VARIATIONS FOR A VARIETY OF MILITARY SEALS FOR PUBLICATION IN A GUIDE FOR USE BY INDUSTRY.							
(810) TITLE - INITIAL PRODUCTION HANDBOOK							
PROBLEM - A HIGH PERCENTAGE OF CRITICAL FIRE CONTROL EQUIPMENT FAILS FIRST ARTICLE TESTS. THE FAILURES ARE TRACEABLE TO THE USE OF INADEQUATE OR OUTDATED PRODUCTION AND TEST PROCEDURES.							
SOLUTION - IDENTIFY AND ISOLATE FIRE CONTROL PRODUCTION PROBLEMS. INVESTIGATE AND TEST NEW TECHNIQUES TO ELIMINATE INADEQUATE MANUFACTURING PROCEDURES. DOCUMENT CRITICAL PRODUCTION PROBLEMS RELATED TO FIRE CONTROL ITEMS.							

MNT FIVE YEAR PLAN
PCS DRAFT 126

COMPONENT	-- MISCELLANEOUS	(CONTINUED)	FUNDING (\$000)				
			PRIOR	E1	E2	E3	E4
(P252) TITLE - INDUCTION HEATING OF VARYING DIAMETER PREFORMS							
PROBLEM - INDUCTION HEATING OF RECYCLED GUN TUBES AND TAPERED PREFORMS REQUIRES VARYING POWER INPUTS TO OBTAIN A UNIFORM TEMPERATURE. THE PRESENT POWER CONTROL DOES NOT PROVIDE THE AUTOMATIC AND PRECISE CONTROL OF POWER NEEDED.							
SOLUTION - DESIGN A DEVICE THAT AUTOMATICALLY ADJUSTS POWER TO THE COILS BASED ON THE PREFORM DIAMETER AT THE SECTION ENTERING THE COIL.							
(8425) TITLE - IMPROVED REPAIR WELDING PRACTICES			200	225			
PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM							
SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM							
(8464) TITLE - PLASTIC COMPONENTS/INSTRUMENTS							
PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.							
SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.							
(8466) TITLE - INTEGRATED MILLIMETER WAVE COMPONENTS			250	450			
PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.							
SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.							
(850) TITLE - NON-TOXIC COOLANT FOR HIGH SPEED MACHINING							
PROBLEM - HIGH SPEED MACHINING CREATES HIGHER PRESSURES, TEMPERATURES, AND VELOCITIES IN THE TOOL/WORKPIECE INTERFACE. PRESENT COOLANT MATERIALS ARE NOT VOLATILE ENOUGH TO PROVIDE SUFFICIENT COOLING AND LURRICITY.							
SOLUTION - NEW COOLANTS ARE NEEDED WITH INCREASED VOLATILITY TO BOTH COOL AND LUBRICATE THE WORKPIECE. CARE IN SELECTION IS NECESSARY TO AVOID THE USE OF HIGHER VOLATILE MATERIALS THAT MAY BE TOXIC.							
COMPONENT -- PROCESSES							
(A64) TITLE - HOT WIRE TIG WELDING							
PROBLEM - WELD QUALITY PROBLEMS LIMIT THE USE OF CONVENTIONAL HIGH PRODUCTIVITY SLAG-FREE WELDING (MIG) FOR WELDING OF ALLOY STEEL. ORDINARY TIG WELDING IS HIGHER QUALITY BUT SLOW.							
SOLUTION - FOCUS ON HOT WIRE TIG WELDING FOR MAXIMUM SPEED AND QUALITY FUSION WELDING OF ALLOY STEEL.							

HMT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	-- PROCESSES	FUNDING (\$000)			
		PRIOR	81	82	83
(CONTINUE)					
(777C)	TITLE - AUTOMATED PROCESS CONTROL FOR MACHINING (CAM)	105	135		
<p>PROBLEM - MACHINING OPERATIONS ARE SELECTED, PARAMETERS ARE SET, AND STANDARDS ARE ESTABLISHED EMPIRICALLY WITH LITTLE OR NO ENGINEERING ANALYSES.</p> <p>SOLUTION - APPLY COMPUTERIZED CONTROLS FOR OVERALL SELECTION OF PROCESSES, OPERATIONS, PARAMETERS, FEEDBACK AND OPTIMIZATION, WITH AUTOMATED ESTIMATING AND DETERMINATION OF REAL TIME AND COSTS.</p>					
(794G)	TITLE - SYnergistic PLATINGS WITH INFUSED LUBRICANTS	121	175		
<p>PROBLEM - LOW FRICTION, WEAR RESISTANT SURFACES ARE NEEDED FOR COMPONENTS IN SLIDING CONTACT.</p> <p>SOLUTION - USE OF TWO-SYSTEM COATINGS INCORPORATING SOLID LUBRICANT INTERLOCKED WITH METAL PLATING.</p>					
(794H)	TITLE - ESTABLISH CUTTING FLUID CONTROL SYSTEM	308	164		
<p>PROBLEM - THE LACK OF A CONTROLLER PROGRAM FOR THE USE OF CUTTING FLUIDS RESULTS IN HIGH MACHINING COSTS AND STICKING OF MANY FLUIDS.</p> <p>SOLUTION - ESTABLISH A PROGRAM TO CONTROL SHOP FLOOR TESTING AND DEFINE METHODS TO CONTROL USE OF CUTTING FLUIDS DURING MANUFACTURING OPERATIONS.</p>					
(794I)	TITLE - ALLOY PLATING TO REDUCE CONSUMPTION OF CRITICAL MATERIAL	165	180		
<p>PROBLEM - SEVERAL COATING MATERIALS SUCH AS CHROMIUM ARE IN SHORT SUPPLY.</p> <p>SOLUTION - REPLACE OR REFUSE THE AMOUNT OF CRITICAL ELEMENTS IN THE COATING BY ALLOY PLATING.</p>					
(794J)	TITLE - "MANUAL" ADAPTIVE CONTROL (CAM)	141			
<p>PROBLEM - APPLICATION AND ADJUSTMENT OF MACHINING RATES AND OTHER PARAMETERS IS UNCERTAIN, SLOW AND COSTLY.</p> <p>SOLUTION - APPLY MANUAL-COMPUTER PROGRAMS ON SHOP FLOOR TO OPTIMIZE AND CONTROL MACHINING OPERATIONS.</p>					
(794K)	TITLE - ESTABLISHMENT OF ION PLATING PROCESS FOR ARMAMENT PARTS	150	142		
<p>PROBLEM - DUE TO REPLACING TOXIC CADMIUM WHEREVER POSSIBLE, CURRENTLY, CADMIUM PLATING IS SPECIFIED FOR APPROXIMATELY 30% OF ARMAMENT COMPONENTS. EQUALITY INTEGRITY IS THE ELIMINATION OF THE HYDROGEN EMITTLEMENT OF STEEL CAUSED BY ALL ELECTROPLATING PROCESSES.</p> <p>SOLUTION - ION PLATING ALUMINUM COATINGS TO STEEL ARMAMENT SUBSTRATES WILL OVERCOME CORROSION, FOR INSTANCE, EXPOSURE TO 71°C OR CADMIUM PLATING.</p> <p>ION PLATING AND ELECTROPLATING TESTS ARE SIMILAR. PROCESS NEEDS TO BE CERTIFIED FOR ARMAMENT USE.</p>					

MAT FIVE YEAR PLAN
FCS DRCPT 126

COMPONENT -- PROCESSES

(CONTINUED)

FUNDING (\$000)

PRIOR 81 82 83 84 85

(8120) TITLE - ADAPTIVE CONTROL TECHNOLOGY (CAT)

PROBLEM - INEFFICIENT USE OF VAC MACHINE TOOLS DUE TO CONSERVATIVE PROGRAMMING IS UNECONOMICAL. ALSO THE INABILITY TO MONITOR A MULTIPLICITY OF TOOL FORMS CHARACTERISTIC OF NC MACHINE CAPABILITY IS A LIMITER.

SOLUTION - EXTEND THE CURRENT ADAPTIVE CONTROL TECHNOLOGY TO CONTROL THE TOOL LOADS IN SMALL MILLS AND DRILLS SO THEY CAN BE PERFORMED IN THE SAME SETUPS. THIS WOULD MAXIMIZE THE USE OF BOTH NC EQUIPMENT AND TOOL SYSTEMS.

(8125) TITLE - SECOND ORDER MFG. METHODS FOR WEAPON COMPONENTS

PROBLEM - DUEING MFG. OF RECOIL CONTROL OFFICES, ERGERS ARE INTRODUCED WHICH REQUIRE REWORK. CORRECTIVE ACTIONS INVOLVE COSTLY RETAILED INSPECTION AND REANALYSIS WITH COMPUTERIZED DESIGN PROGRAMS TO DEFINE POSSIBLE REWORK ALTERNATIVES.

SOLUTION - AN IMPROVED MANUFACTURING METHOD UTILIZING ADAPTIVE CONTROLS AND AUTOMATED INSPECTION EQUIPMENT WILL BE ESTABLISHED. MACHINE TOOLS WILL BE RETROFITTED.

(8200) TITLE - APPLICATION OF HIGH-RATE ABRASIVE MACHINING

PROBLEM - CONVENTIONAL GRINDING IS SLOW AND COSTLY. LONG, MULTIPLE PASSES AND INFEDS ARE REQUIRED TO SIZE AND FINISH WEAPON COMPONENTS.

SOLUTION - APPLY HIGH-SPEED ABRASIVE-BELT MACHINING.

(8250) TITLE - ELECTROCHEMICAL GRINDING OF WEAPON COMPONENTS

PROBLEM - SIZING AND FINISHING OF LARGE, LONG WEAPON COMPONENTS BY CONVENTIONAL GRINDING IS SLOW AND COSTLY. OFTEN REQUIRING MULTIPLE OPERATIONS, SET UPS, WHEEL CHANGES, AND REPETITIVE MULTIPLE PASSES. FOR EXAMPLE - PLANNING / GRINDING HOLLOWED MOUNT RAIL.

SOLUTION - RETROFIT EXISTING, SPECIAL LONG BED, HORIZONTAL, SURFACE GRINDER WITH ELECTROLYTIC SYSTEM TO PROVIDE FAST, SINGLE PASS ROUGH FINISHING OF LARGE COMPONENTS. ELIMINATE ROUGHING BY PLANNING OR MILLING BEFORE ELECTROLYTIC GRINDING.

(8260) TITLE - SOLVENT BASED PAINTING PROCESS

PROBLEM - CURRENTLY, SPRAY PAINT COATS ARE USED FOR COATING METALS FOR HITTING, PUSH AND CARRIAGE RESISTANCE. THIS METHOD REQUIRES HYDROCARBON SOLVENTS AND A VEHICLE FOR THE PAINT. OVERGROUTING IS REQUIRED TO THE AREA OF PAINT.

SOLUTION - NEW SPECIFICATIONS MUST BE PREPARED TO SPECIFY THE USE OF NON SOLVENT PAINT. PAINT METHODS SUCH AS ELECTROSTATIC PAINTING WILL BE ALREADY DEVELOPED. HYDROCARBON SOLVENTS. THIS WILL ALSO REDUCE WATER CONSUMPTION, REDUCE FUEL EXPENDITURE, AND REDUCE SOLVENTS.

FUNDING (\$000)

260

225

566

613

175

175

200

WTI FIVE YEAR PLAN
FCS TRCT 126

FUNDING (\$000)

	PRIOR	E1	E2	E3	E4	E5
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(CONTINUE)

1.1.1 -- PROCESSES

(E1) TITLE - IMPROVED CASTING TECHNOLOGY (CAM)

PROBLEM - EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.

SOLUTION - USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND CATING AND RISING CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.

(E2) TITLE - AUTOMATED SURFACE COATING OF CANNON (CAM)

PROBLEM - IT REQUIRES APPROXIMATELY 2 1/2 HOURS PER TUBE TO APPLY ONE UNDER COAT AND TWO FINISH COATS OF PAINT BY MANUAL BRUSHING. CURRENT DRYING METHODS REQUIRE EXCESSIVE FLOOR SPACE AND OVERHEAD CRANE SUPPORT.

SOLUTION - DESIGN AN AUTOMATED SURFACE COATING SYSTEM THAT CONSISTS OF ELECTRONICALLY CONTROLLED HYDRAULICALLY POWERED ELECTRO-STATIC SPRAYING MACHINES, INTEGRATED MATERIAL HANDLING, AND AUTOMATIC DRYING SYSTEMS. ALL OPERATIONS COMPUTER CONTROLLED.

(E3) TITLE - ESTABLISHMENT OF ZINC ION VAPOR DEPOSITION PROCESS

PROBLEM - NO PROBLEM PROVIDED BY ARRACOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.

(E4) TITLE - WARM FORGING OF WEAPON COMPONENTS (CAM)

PROBLEM - EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.

SOLUTION - BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES.

(E5) TITLE - DESIGN CRITERIA FOR MARCEAING (CAM)

PROBLEM - SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELMENTS ARE ENCOUNTERED. PHOTOLENS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.

SOLUTION - THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAFT, AND COMPOSITION WILL BE STABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION.

MID FIVE YEAR PLAN
FCS FRACM 126

COMPONENT	-- PROCESSES	TITLE	CONTINUOUS	FUNDING (\$000)					
				PRIOR	P1	P2	P3	P4	P5
(8406)	AUSTENITIZING AND HAMMERING PROCEDURES FOR ARMOR CASTINGS	(8406) TITLE - AUSTENITIZING AND HAMMERING PROCEDURES FOR ARMOR CASTINGS	CONTINUOUS	120	120	120	120	120	120
		PROBLEM - ARMOR CASTINGS HAVE TO PASS IMPACT REQUIREMENTS WHICH DEFEND IF ON THE HARNESS. SOME OF THE HEATS FAILED TO MEET THESE STRIGENT REQUIRENTS.							
		SOLUTION - DEFENDING UPON MNS DISTRIBUTION. HIGHER TEMPERATURE AUSTENITIZING TREATMENTS RESULTED IN THIS TEMPERATURE RANGE WILL BE EVALUATED AND THE EFFICACY OF NORMALIZING AND HAMMERING TREATMENTS FOR THE CAST ARMOR WILL BE DETERMINED.							
(8503)	ELECTRO-MECHANICAL JOINING TECHNIQUES	(8503) TITLE - ELECTRO-MECHANICAL JOINING TECHNIQUES		120					
		PROBLEM - FURTHER MECHANICAL (FRICTION WELDING) OR MOSTLY ELECTRICAL (RESISTANCE) WELDING MACHINES OF VARIOUS TYPES WOULD HAVE TO BE LARGE AND WOULD TAKE EXCESSIVE TIME TO WELD JOINT AREAS 2 ⁶ SQUARE INCHES OR MORE.							
		SOLUTION - COMBINE THE FEATURES OF BOTH METHODS TO DELIVER SUFFICIENTLY LARGE SPECIFIC ENERGY FOR WELDING OF LAGE PARTS.							
(8504)	INTEGRATED DESIGN FOR CAST/WRUGHT COMPONENTS	(8504) TITLE - INTEGRATED DESIGN FOR CAST/WRUGHT COMPONENTS		200					
		PROBLEM - MANY WEAPON COMPONENT SPECIFICATIONS REQUIRE THE DESTRUCTIVE TESTING OF A SEPARATELY PREPARED COUPON RATHER THAN THE ACTUAL PART. FREQUENTLY THE MECHANICAL PROPERTIES OF THE MATERIAL IN THE COUPONS DIFFER FROM THOSE IN THE CASTINGS.							
		SOLUTION - THIS PROGRAM WILL ESTABLISH PROCEDURES FOR DESIGNING AND TREATING COUPONS THAT ACCURATELY REPRESENT THE ACTUAL PARTS.							
(8522)	LASER SURFACE ALLOYING PROCESS FOR IMPROVED WEAR RESISTANCE	(8522) TITLE - LASER SURFACE ALLOYING PROCESS FOR IMPROVED WEAR RESISTANCE		100					
		PROBLEM - NO PROBLEM PROVIDED BY ARRACOM.							
		SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.							
(8505)	ION IMPLANTATION OF WEAPON COMPONENTS	(8505) TITLE - ION IMPLANTATION OF WEAPON COMPONENTS		375					
		PROBLEM - NO PROBLEM PROVIDED BY ARRACOM.							
		SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.							
(8529)	ISOTHERMAL FORGING OF WEAPONS	(8529) TITLE - ISOTHERMAL FORGING OF WEAPONS		150					
		PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRACOM							
		SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRACOM							

NEW FIVE YEAR PLAN
RCS DRC/T 126

COMPONENT	TITLE	FUNDING (\$000)	PAST				
			PRIOR	61	62	63	64
1824B	TITLE - APPLICATION OF HIGH-RATE CUTTING TOOLS	112					
	PROBLEM - APPLICATIONS OF NEW HIGH-RATE CUTTING TOOLS LAG DUE TO LACK OF TESTING, ANALYSES AND ENGINEERING APPLICATIONS. MANUFACTURERS PROVIDE INSUFFICIENT DATA FOR EFFICIENT APPLICATIONS OF CERAMICS, OXIDES, NITRIDES, BORIDES, AND DIAMONDS.						
	SOLUTION - HIGH-RATE CUTTING TOOLS WILL BE TESTED, ANALYSED, AND APPLIED WITH BOTH NEW AND EXISTING MACHINING TOOLS. PRACTICAL GUIDELINES WILL BE ESTABLISHED FOR BOTH PHYSICAL AND ECONOMIC MACHINING PARAMETERS AND LIMITS.						
18307	TITLE - CRYOGENIC TREATMENT OF TOOL STEELS	160					
	PROBLEM - MANY METAL CUTTING OPERATIONS REQUIRE TOOL STEEL CUTTERS OF FORMING TOOLS RATHER THAN CARBIDE OR CERAMIC MATERIALS. TOOL STEEL MATERIALS DO NOT HAVE AS LONG A USEFUL LIFE AS DO THE HARDESTE MATERIALS AND REQUIRE FREQUENT RESHARpening.						
	SOLUTION - CRYOGENIC TREATMENT OF TOOL STEELS GREATLY IMPROVES THE WEAR CHARACTERISTICS OF THE TOOL AND GREATLY REDUCES THE FREQUENCY OF RESHARpening.						
1847C	TITLE - SPECIAL TOOLS FOR FLEXIBLE MANUFACTURING	125					
	PROBLEM - CONVENTIONAL, NC, AND FLEXIBLE MANUFACTURING SYSTEMS USE SEPARATE TOGGLING WHICH LACES COMPLETE FLEXIBILITY FOR MULTIPLE-TOOL AND/OR MULTIPLE-SPINDLE CUTTING WITH INTERCHANGEABILITY.						
	SOLUTION - CLASSIFY TOGGling BY CATEGORY, ESTABLISH INTERCHANGEABILITY, APPLY SPECIAL MULTIPLE TOOL AND/OR MULTIPLE-SPINDLE TOGGling IN FLEXIBLE MANUFACTURING OPERATING AND SYSTEMS.						
1877L	TITLE - MANUFACTURE OF SPLIT RING PREFORM SEALS	500					
	PROBLEM - SPLIT RING PREFORM PRECISION METHODS ARE OUTDATED AND COSTLY. DESIGNING MUCH HAND FINISHING BY HIGHLY SKILLED WORKERS. REJECTION RATE HIGH WITH MUCH WASTE.						
	SOLUTION - AUTOMATES THE PREPARED SEALS. WILL BE ADAPTED. NEW METHOD OF SPLITTING PREFORMS. USES STICK REMOVAL. SPECIAL EQUIPMENT WILL BE DESIGNED. HIGH PRECISION FOR MINIMIZING HAND FINISHING. HIGH SKILL OPERATORS.						

MMI FIVE YEAR PLAN
FCS FRCT 126

COMPONENT -- FREECH MECHANISMS	TITLE -- HOT ISOSTATIC PRESSING (HIP) OF LARGE CANNON COMP	(CONTINUE(1))					FUNDING (\$000)
		PRIOR	μ_1	μ_2	δ_3	δ_4	
(7526)	PROBLEM - MANY HOURS ARE REQUIRED TO MACHINE THE FREECH BLOCK FORGING TO THE FINISHED PART. MORE THAN 25% OF FORGING BECOMES CHIPS. WITH HIGH COST OF ALLOY STEEL, THIS INCIDENCE A VERY COSTLY WASTE OF MATERIAL.	216	295				
SOLUTION - HOT ISOSTATIC PRESSING (HIP) WILL FORM FREECH BLOCKS TO NEARLY FINAL SHAPE, GREATLY REDUCING MACHINING COSTS.							
(7927) TITLE - GENERATION OF FAIR MACHINING SURFACES		86	137				
PROBLEM - TO OBTAIN A CIRCLE OF STOCK IN A ROUGH CAST COMPONENT, IT IS CURRENTLY NECESSARY TO "DRAW" THE FINISHED COMPONENT ON THE MATERIAL USING HT GAGE AND LAYOUT TEMPLATES. THIS IS DONE ON A TABLE FROM WHICH THE PART MOVES TO A MACHINE FOR SEMI-AUTOMATIC SFT-OFF.							
SOLUTION - USING PRESENT LAYOUT TECHNIQUES, SUCH AS OPTICAL SHADOW LAYOUT TEMPLATES, THE COMPONENT CAN BE POSITIONED DIRECTLY ON THE MACHINE TO ESTABLISH THE FIRST CUT ELIMINATING THE INITIAL LAYOUT OPERATION.							
(7928) TITLE - ROTOTIZED BENCHING OPERATIONS (CAM)		113	287				
PROBLEM - BENCHING OPERATIONS ON FREECHBLOCKS AND RINGS ARE UNSAFE AND TIME CONSUMING.							
SOLUTION - DEVELOP INDUSTRIAL ROTOTIZED BENCHING THRUFEED OPERATIONS.							
(8029) TITLE - RAPID INTERNAL THREADING		69	366				
PROBLEM - PRODUCING INTERNAL METALLIC THREADS IN FREECH RINGS IS A SERIOUS PRODUCTION PROBLEM BECAUSE OF BOTH THE TECHNIQUES AND TOOLING REQUIRED. CONVENTIONAL THREAD POKING REQUIRES A PRODUCTION BOTTLENECK.							
SOLUTION - CURRENT TECHNOLOGY AND EXISTING TOOLING BREAKTHROUGHS HAVE EXPANDED HIGH SPEED THREADING CAPABILITIES. AUTOMATIC THREADING WILL BE AN EFFICIENT, ECONOMIC REPLACEMENT FOR THE CURRENT MILLING-TYPE THREAD MACHINING PROCESSES.							
(8120) TITLE - AFFLUENT METALLURGY FORGING TO COMB.							
PROBLEM - FORGINGS AND CASTINGS ARE FAIRLY COMPLICATED OVERSIZE AND FREQUENTLY MACHINED DOWN TO FINAL DIMENSIONS. FINAL CONFIGURATION INVOLVES A LARGE AMOUNT OF MANAGING AND MACHINING TO REMOVE ALLOY STEEL AS CHIPS.							
SOLUTION - RECENT ADVANCES HAVE OCCURRED IN FASTER METALLURGY FORGING. THE ADVANCE IS THAT FORGED PARTS ARE NOT OVERSIZE COMPONENTS WHICH REQUIRES A LARGE AMOUNT OF MACHINING TO REMOVE ALLOY STEEL. INTEGRATE MECHANICAL PROPERTIES. UTILIZE NEW TECHNOLOGY.							

MOT FIVE YEAR PLAN
RCS DRCHT 126

COMPONENT	(CONTINUED)	FUNDING (\$000's)			
		PRIOR	'81	'82	'83
(P105) TITLE -- BREACH MECHANISMS					85
(P105) TITLE -- ESTABLISH ROUGH THREAD BLANKS 8 IN. M201 HUSHING					
PROBLEM - A SINGLE POINT TOOL IS USED TO PRODUCE THE ROUGH FORMED BLANK FOR STEP THREADS ON STEP BLOCKS. CURRENT TIME VALUE IS 13.9 HOURS.		88	292		
SOLUTION - POSSIBLE APPLICATIONS OF MULTIPLE SLOTTING TOOLS AND MILLING OFFER A FAR MORE EFFICIENT METAL REMOVAL PROCESS AIMED AT TIME/COST REDUCTION.					
(E117) TITLE - SHAPED CASTING OF ESR MATERIAL	207				
PROBLEM - COMPONENTS REQUIRE FORGING PLUS EXTENSIVE MACHINING TO ACHIEVE THE FINAL DIMENSIONS. THE FORGING PROCESS HAS ENCOUNTERED SOME PROBLEMS WITH THE MECHANICAL PROPERTIES RECURRING IN THE STEEL.					
SOLUTION - A PRODUCTION PROCESS CAPABLE OF PRODUCING A SHAPED CASTING.		103	634		
(P237) TITLE - MULTIPLE MACHINING OF CARFISH HOUSINGS	203				
PROBLEM - THE 15MM WIDE AND 14.5MM CAVITY HOUSINGS REQUIRE NUMEROUS OPERATIONS FOR THE PRODUCTION OF COMPLEX INSIDE AND OUTSIDE DIAMETERS. STANDARD EQUIPMENT CANNOT PRODUCE THESE FEATURES EFFICIENTLY.					
SOLUTION - A SPECIAL EQUIPMENT DESIGN WILL BE APPLIED TO ALLOW MACHINING AS MANY SURFACES AS POSSIBLE IN ONE SETUP.					
(P318) TITLE - IMPROVED BORING TOOLS FOR PREBENCH RING LURS					
PROBLEM - PRESENT METHODS OF PRODUCING THE VARIOUS HOLES ON BREECH RINGS ARE TREPANNING, TWIST DRILLING, GUN DRILLING, AND FINISH BORING. PRODUCTION OF THESE HOLES IS A TIME CONSUMING AND COSTLY OPERATION.					
SOLUTION - THE JOINT PROCESS OF INJECTION DRILLING AND INDEXABLE CARBIDE INSERT HOLE DRILLING PROMISES TO REDUCE THE SEQUENCE STEPS NOW REQUIRED AND TO PROVIDE A FAR MORE COST EFFECTIVE MEANS OF PRODUCING AN ACCEPTABLE HOLE.					
(P359) TITLE - EFFLIC OF NON-TRADITIONAL SURFACE MACHINING METHODS	700	400			
PROBLEM - PRESENT METHODS OF SURFACE HARDENING, WEAPON COMPONENTS ARE COSTLY, TIME CONSUMING, AND MAY IMPART UNRELIABLE RESIDUAL STRESSES.					
SOLUTION - TO TRANSFER THE SURFACE LAYER OF THE STEEL TO ALLOW MATERIAL TO BE UNIFORMLY SURFACE. THE ADVANTAGE, AT LESS ENERGY USAGE, POLLUTION FREE, ALLOW HIGHER PRODUCTION RATES, AND MINIMAL POST-PROCESSING SUCH AS CLEANING AND STRAIGHTENING.					

1971 FIVE-YEAR PLAN
ECS PROCT 126

COMPONENT --	TITLE --	DESCRIPTION	FUNDING (\$000)				
			F10R	R1	R2	R3	R4
(844) TITLE - CONTROLLED GRAIN SIZE CASTINGS. PRODUCTIVE AND HEAT TREAT	(844)	PROBLEM - FINER GRAIN CASTINGS HAVE DEMONSTRATED AN IMPROVEMENT IN LOW CYCLE FATIGUE LIFE BY A FACTOR OF TWO. IT IS EXPECTED THAT A HEAT TREATMENT WILL EXTEND THE LIFE STILL FURTHER.	300	800			
SOLUTION - PROVIDE FOR CASTING A FINER GRAIN BLOCK BY ONE OF THE AVAILABLE TECHNIQUES THEN OBTAIN THE HEAT TREATMENT FOR THE CHOSEN ALLOY. LIFE IMPROVEMENTS WILL BE DEMONSTRATED.							
COMPONENT -- GENERAL							
(7726) TITLE - GROUP TECHNOLOGY OF WEAPONS SYSTEMS	(7726)	PROBLEM - THERE IS A NEED TO REDUCE AND CONTROL THE PROLIFERATION OF PARTS AND DESIGNS FOR ITEMS MANUFACTURED AT WATERVILLE ARSENAL.	63	180	264		
SOLUTION - THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.							
(8026) TITLE - APPLIC OF SYNTHETIC JUTE TO CLOTHES + CORP.	(8026)	PROBLEM - QUENCHANTS ARE NOT SATISFACTORY FROM BOTH THE THERMAL AND SAFETY STANDPOINT.	380	250			
SOLUTION - USE OF POLYMERIC MATERIALS TO ALTER GUTTA PERCHA POWER OF RADIATION AND ALLOW HEAT TRANSFER TO OBTAIN RANGE OF COOLING RATES WHILE ELIMINATING HAZARDS ASSOCIATED WITH OIL QUENCHING.							
(8246) TITLE - SHORT-CYCLE HEAT TREATING OF WEAPON COMPONENTS	(8246)	PROBLEM - HEAT TREATING SOAK TIMES ARE DETERMINED WITHOUT CONSIDERATION OF THE RELATIONSHIPS BETWEEN COMPOSITION, CONFIGURATION, THICKNESS, AND DETRIMENTAL EFFECTS OF AUSTENITIC CHAIN. GRUBB. CONSEQUENTLY, CONSIDERABLE ENERGY IS WASTED.	102	125			
SOLUTION - SUITABLE AUTOMATIC PRODUCTION METHODS WILL BE USED TO DETERMINE THE PROPERTIES OBTAINED AT MINIMAL PROCESSING TIME; TO REDUCE ENERGY CONSUMPTION AND INCREASE PRODUCTION EFFICIENCY.							
(8323) TITLE - SPRAY-AND-FUSE PROCESSING OF APPAMENT COMPONENTS	(8323)	PROBLEM - MISMATCHED AND BORN WEAPON COMPONENTS ARE ACT ONLY COSTLY TO REPLACE BUT SURFACE OF STATIC MATERIALS IMPACT ON THE SUPPLY AND FABRICATION, OF NEW COMPONENTS.	205	185			
SOLUTION - UTILIZE THE INTERNAL SPRAY AND FUSE COATING PROCESS TO SALVAGE OR RECLAIM OVERSIZED OR DEFECT WEAPON COMPONENTS (I.E., P14G RECOIL PISTONS).							

MAT FIVE YEAR PLAN
RCS
DRMT 126

COMPONENT	TITLE -- GENERAL	(CONTINUED)	FUNDING (43000)			
			PRIOR	F1	F2	F3
(83-6)	TITLE - APPLICATION OF CORROSION RESISTANT GALVANIC COATINGS		175	210		
	PROBLEM - CURRENT METAL FINISHES DO NOT PROVIDE ADEQUATE CORROSION AND HEAT RESISTANCE. COMPONENTS ARE REPLACED OR REWORKED BEFORE THEIR INTENDED LIFE. FREQUENT MAINTENANCE IN THE FIELD AND DEPOTS ADD TO THE OVERALL COST OF THE COMPONENTS.					
	SOLUTION - A NEW PROCESS HAS EMERGED FOR APPLYING SUPERIOR CORROSION AND HEAT RESISTANT COATINGS. THE PROCESS, USING SERMIL-16, CONSISTS OF AN AUTOMATED SPRAY-PAKE PROCESS FOR A COATING OF ALUMINUM/CLERICMIC AND INORGANIC COATINGS.					
(8345)	TITLE - IMPROVED TOOLING PERFORMANCE. PREDICTIVE MODEL (CAM)		120			
	PROBLEM - INABILITY TO PREDICT TOOL PERFORMANCE LIMITS TOOL WEAR LIFE AND OFTEN RESULTS IN PREMATURE FAILURE OF THE INSERT. THUS LIMITING PRODUCTIVITY AND INCREASING MACHINE DOWN TIME.					
	SOLUTION - ESTABLISH A METHOD FOR EVALUATING QUALITY/CAPABILITY OF TOOLING INSERTS TO OPTIMIZE WEAR LIFE BY VARYING MACHINING PARAMETERS (FEEDS, SPEEDS, DEPTH OF CUT) AND PROVIDE FOR STATISTICAL PREDICTION ABOUT FAILURE INTERVALS.					
(8353)	TITLE - IMPROVED PRODUCTION OF MUZZLE BRAKE CASTINGS		300			
	PROBLEM - ONLY ONE COMMERCIAL SOURCE OF MUZZLE BRAKE CASTINGS FOR THE 155MM M115 EXISTS. NON-COMPETITION RESULTS IN A HIGHER COST PER MUZZLE BRAKE CASTING. THE SINGLE SOURCE SITUATION LIMITS MOBILIZATION RESPONSE.					
	SOLUTION - INITIATE "BEST EFFORT" CONTRACTS TO SEVERAL FOUNDRIES TO ESTABLISH CAPABILITY TO MEET TDP REQUIREMENTS AND OPEN THE PROCUREMENT PROCESS TO ADDITIONAL QUALIFIED SOURCES.					
(8567)	TITLE - FORMING OF MULTI-LAYERED ARMAMENT COMPONENTS		410			
	PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM					
	SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM					
COMPONENT	-- GUN MOUNTS					
(8022)	TITLE - COATING TUBE SUPPORT SLEEVES WITH BEARING MATERIALS		180	200		
	PROBLEM - METALLIZED COATINGS ON SUPPORT SLEEVES FOR GUN MOUNTS ARE BRITTLE AND LACK BOND STRENGTH.					
	SOLUTION - USE INDUCTION/ARC-INFRA GAS METHODS TO COAT SLEEVES WITH BEARING MATERIALS.					

COMPONENT -- GUN MOUNTS

(CONTINUED)

(851) TITLE - IMPROVED MELTING AND POURING TECHNOLOGY

PROBLEM - THERE IS A HIGH REJECTION RATE FOR CASTING POURED AT RIA BECAUSE MODERN TECHNIQUES ARE NOT USED TO MEASURE AND CONTROL PROCESS PARAMETERS AND POROSITY.

SOLUTION - PROCEDURES TO MINIMIZE DISSOLVED GAS AND TO MORE ACCURATELY MEASURE GAS CONCENTRATIONS WILL BE ESTABLISHED. METHODS OF MEASURING TEMPERATURES AND COMPOSITIONS OF ATMOSPHERES IN FURNACES AT RIA WILL BE ESTABLISHED.

COMPONENT -- RECOIL MECHANISMS

(828) TITLE - PALL SIZING OF RECOIL CYLINDERS

PROBLEM - INTERNAL HONING IS REQUIRED TO ACHIEVE THE SURFACE FINISHES AND TOLERANCES REQUIRED FOR RECOIL CYLINDERS. HONING IS EXTREMELY TIME CONSUMING AND ALSO NOISY.

SOLUTION - REPLACE INTERNAL HONING WITH BALL SIZING ON RECOIL SIZING MECHANISMS BY FORCING A BALL (WITH A DIAMETER SLIGHTLY LARGER THAN THAT OF THE CYLINDER) THROUGH THE CYLINDER. THE SURFACE FINISH AND TOLERANCE CRITERIA CAN BE ACHIEVED.

(829) TITLE - IMPROVED MACHINING PROCEDURES FOR RAILS

PROBLEM - CURRENTLY THE FONETAIL CONFIGURATION ON THE RAILS IS MILLED WITH A SERIES OF HIGH SPEED STEEL FORM MILLS. THESE MILLS REQUIRE A GREAT DEAL OF SHARPENING, AND THIS CHANGES THEIR SIZE. THIS COMPOUNDING THE PROBLEM OF MAINTAINING ALIGNMENT.

SOLUTION - A 60 PERCENT REDUCTION IN MANUFACTURING TIME COULD BE REALIZED USING THE LATEST CONCEPTS IN MILLING TOOLS. THESE INCLUDE CROSS AXIAL MOVEMENTS AND A METHOD OF HIGH SPEED MILLING USING INDEXABLE CARBIDE INSERTS.

(820) TITLE - IMPROVED FABRICATION OF WEAK SURFACES

PROBLEM - PRESENTLY CRIMPING AND HONING OPERATIONS ON WEAK SURFACES RESULT IN PARTICLE INCLUSIONS WHICH COME IN CONTACT WITH HYDRAULIC AND PRODUCE HIGH WEAR RATES.

SOLUTION - USING ADVANCED METHODS REMOVE FOREIGN PARTICLES PRIOR TO THE FINAL GRINDING OR HONING OPERATIONS IF MORE EFFECTIVE. AFTER FINAL GRINDING OR HONING.

(840) TITLE - FOUNDRY MOLDING WITH POLYSTYRENE PATTERNS

PROBLEM - COMPLEX CASTING SHAPES REQUIRE A LARGE NUMBER OF CORES WHICH ARE EXPENSIVE TO MAKE, SET, AND ANCHOR IN PLACE. ALSO, WOOD PATTERN COSTS ARE HIGH FOR THESE CASTINGS.

SOLUTION - THE USE OF LOW DENSITY EFFLUENTABLE POLYSTYRENE PATTERNS REQUIRE NO CORES, EVEN FOR COMPLEX SHAPES AND ELIMINATE THE NEED FOR WOODEN PATTERNS AND CORE PEXSES.

FUNDING (\$000)

PRIOR P1 P2 P3 P4 P5

193 164

193 164

PROBLEM - THERE IS A HIGH REJECTION RATE FOR CASTING POURED AT RIA BECAUSE MODERN TECHNIQUES ARE NOT USED TO MEASURE AND CONTROL PROCESS PARAMETERS AND POROSITY.

SOLUTION - PROCEDURES TO MINIMIZE DISSOLVED GAS AND TO MORE ACCURATELY MEASURE GAS CONCENTRATIONS WILL BE ESTABLISHED. METHODS OF MEASURING TEMPERATURES AND COMPOSITIONS OF ATMOSPHERES IN FURNACES AT RIA WILL BE ESTABLISHED.

COMPONENT -- RECOIL MECHANISMS

(828) TITLE - PALL SIZING OF RECOIL CYLINDERS

PROBLEM - INTERNAL HONING IS REQUIRED TO ACHIEVE THE SURFACE FINISHES AND TOLERANCES REQUIRED FOR RECOIL CYLINDERS. HONING IS EXTREMELY TIME CONSUMING AND ALSO NOISY.

SOLUTION - REPLACE INTERNAL HONING WITH BALL SIZING ON RECOIL SIZING MECHANISMS BY FORCING A BALL (WITH A DIAMETER SLIGHTLY LARGER THAN THAT OF THE CYLINDER) THROUGH THE CYLINDER. THE SURFACE FINISH AND TOLERANCE CRITERIA CAN BE ACHIEVED.

(829) TITLE - IMPROVED MACHINING PROCEDURES FOR RAILS

PROBLEM - CURRENTLY THE FONETAIL CONFIGURATION ON THE RAILS IS MILLED WITH A SERIES OF HIGH SPEED STEEL FORM MILLS. THESE MILLS REQUIRE A GREAT DEAL OF SHARPENING, AND THIS CHANGES THEIR SIZE. THIS COMPOUNDING THE PROBLEM OF MAINTAINING ALIGNMENT.

SOLUTION - A 60 PERCENT REDUCTION IN MANUFACTURING TIME COULD BE REALIZED USING THE LATEST CONCEPTS IN MILLING TOOLS. THESE INCLUDE CROSS AXIAL MOVEMENTS AND A METHOD OF HIGH SPEED MILLING USING INDEXABLE CARBIDE INSERTS.

102 125

PRIOR P1 P2 P3 P4 P5

193 164

193 164

PROBLEM - PRESENTLY CRIMPING AND HONING OPERATIONS ON WEAK SURFACES RESULT IN PARTICLE INCLUSIONS WHICH COME IN CONTACT WITH HYDRAULIC AND PRODUCE HIGH WEAR RATES.

SOLUTION - USING ADVANCED METHODS REMOVE FOREIGN PARTICLES PRIOR TO THE FINAL GRINDING OR HONING OPERATIONS IF MORE EFFECTIVE. AFTER FINAL GRINDING OR HONING.

267

MMI FIVE YEAR PLAN
RCS DRCT 126

COMPONENT -- RECOIL MECHANISMS	TITLE -- HONE FORMING OF RECOIL CYLINDERS	FUNDING (\$000)					
		PRIOR	81	82	83	84	85
(CONTINUED)							
(8422) TITLE - HONE FORMING OF RECOIL CYLINDERS	PROBLEM - REPLACEMENT OF SCARRED, WORN OR MISMACHINED RECOIL CYLINDERS ARE COSTLY AND TIME-CONSUMING IN TERMS OF LONG-LEAD TIMES FOR MATERIAL DELIVERY AND MACHINING. CYLINDER REPLACEMENT REQUIRES ADDITIONAL CONSUMPTION OF STRATEGIC MATERIALS.	450	700				
SOLUTION - HONE FORMING IS A SIMULTANEOUS PROCESS WHERE HONING AND MATERIAL BUILDOUT BY ELECTROPLATING TAKE PLACE TO ACHIEVE THE DESIRED DIMENSION AND FINISH. COST SAVINGS CAN BE ACHIEVED WITH THE PROCESS FOR RECOIL CYLINDER MANUFACTURE AND RECLAMATION.							
COMPONENT -- TUBES		900					
(7309) TITLE - REPLACEABLE STEEL LINERS FOR CANNON TUBES	PROBLEM - TUBE LIFE IN SEVERAL HIGH PERFORMANCE CANNONS SUCH AS THE 155MM HOW M199 AND OTHERS IS LIMITED BY EROSION AND LOSS OF ACCURACY IN A RELATIVELY FEW ROUNDS AT MAXIMUM CHARGE.						
SOLUTION - DEVELOP MFG. PROCESS FOR FABRICATION OF THIN LINERS AND PROCESS FOR PLACING THESE LINERS IN CANNON TUBES, THEREBY EXTENDING CANNON LIFE.							
(7916) TITLE - APPLICATION OF LOW COST MANDREL MATERIALS	PROBLEM - TO PRODUCE A SATISFACTORY SUBSTITUTE FOR TUNGSTEN CARBIDE MANDREL TO ELIMINATE SOLE SOURCE PROCUREMENT. THE PRICE OF THE MANDRELS HAS INCREASED FIFTY PERCENT OVER THE LAST 5 YEARS.	168					
SOLUTION - HIGH SPEED STEEL MANDRELS HAVE BEEN USED FOR SWAGE PROCESS IN UNITED KINGDOM. THIS SHOULD BE A SUBSTITUTE FOR TUNGSTEN CARBIDE MANDRELS.							
(7925) TITLE - PORE EVACUATOR HOPING	PROBLEM - BOTH ENDS OF THE BORE OF EVACUATOR HAVE SIMILAR DIAMETER BORES AND REQUIRE ALMOST EQUAL MACHINING WITH HIGH COST OF MACHINING TIME. REDUCTION OF MACHINING TIME IS IMPERATIVE. ORIENTATION OF THE BORES IS IN RELATION TO EACH OTHER.	111	248				
SOLUTION - A SPECIAL PURPOSE MACHINE AND TOOLING FGK PROVIDING A HEAD FOR EACH END OF THE EVAC CHAMBER CAN BE DEVELOPED TO PRODUCE BOTH BORES SIMULTANEOUSLY. IF BOTH SURFACES WERE PRODUCED FROM THE SAME SET UP, ORIENTATION OF CENTERLINES WOULD BE ASSURED.							
(7953) TITLE - IMPROVING FABRICATION AND REPAIR OF ANODES	PROBLEM - THE PURCHASE OF NEW OR THE REPAIR OF ANODES IS EXPENSIVE AND TIME CONSUMING. CURRENTLY USED METHOD ON LEAD CLADDING IS INFERIOR TO ELECTRODEPOSITION. LEAD BECAUSE OF VARIATIONS OF THICKNESS AND OXIDE INCLUSIONS.	150	100				
SOLUTION - AN ELECTRODEPOSITION SYSTEM CAPABLE OF DEPOSITING LEAD WILL ENABLE FABRICATION AND MAINTAIN ANODES IN CONSIDERABLY LESS TIME THAN NOW REQUIRED AT A LOWER COST.							

PPT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT -- TUBES	TITLE -- HIGH SPEED ABRASIVE BELT FINISHING	(CONTINUED)					FUNDING (\$000)
		PRIOR	'81	'82	'83	'84	
(804)	TITLE - SLIDE SURFACE DIAMETER AND FINISH IS PRESENTLY PRODUCED ON CYLINDRICAL GRINDING MACHINES USING ABRASIVE WHEELS. THE TIME IT TAKES FOR THIS OPERATION CAN BE SIGNIFICANTLY REDUCED.	324		142			
SOLUTION - ABRASIVE BELT GRINDING DEFENDING ON ITS APPLICATION HAS METAL REMOVAL RATES WHICH CAN EXCEED MILLING OR GRINDING AT THE SAME TIME PRODUCING EXCELLENT TOLERANCES AND SURFACE FINISH.							
(805)	TITLE - RECYCLING SPENT GUN TUBES BY LSP MELTING			204			
PROBLEM - BECAUSE OF ANTICIPATED SHORTAGES IN THE AVAILABILITY OF CRITICAL ALLOYS, IT IS ADVANTAGEOUS TO UTILIZE SPENT GUN TUBES.							
SOLUTION - TUBES WHICH CANNOT BE DIRECTLY ROTARY FORGED MIGHT BE REMELTED DIRECTLY BY ESR INTO INGOTS FOR USE ON THE ROTARY FORGE.							
(811)	TITLE - HIGH VELOCITY MACHINING		37	414	37	414	
PROBLEM - SPEED OF MACHINING CANCER TUBES IS LIMITED WITH CURRENT EQUIPMENT.							
SOLUTION - EVALUATE HIGH SPEED METAL REMOVAL METHODS AND AVAILABLE EQUIPMENT. FUTURE YEARS FUNDING WILL PROVIDE FOR ACQUISITION AND TESTING OF NEW MACHINE AND PROCESS.							
(816)	TITLE - LARGE CALIBER POWDER CHAMFER FORGING		59	159	72		
PROBLEM - FOUNDRY CHAMFERS PRODUCTION ON LARGE BORE CANNON, A IN M201. CURRENTLY REQUIRES 14 HOURS TO ACCOMPLISH BOTH ROUGH AND FINISH OPERATIONS.							
SOLUTION - PERFORM THE FINISHING OPERATION IN THE SAME SETUP AS THE ROUGHING OPERATION BUT USING AS A CUTTING MEDIA DIAMOND FINISHING TOOLS WHICH AT VERY HIGH SPEEDS PRODUCE EXCELLENT SURFACE FINISH. THIS PROCESS WOULD ELIMINATE ONE GRINDING OPERATION.							
(817)	TITLE - CREEP FEED CRUSH FORM GRINDING		661	73			
PROBLEM - THE BRACKET SLOT ON THE 105MM M66 ERECTION RING IS A HIGH COST OPERATION. IT IS CURRENTLY MILLED WITH FORM TOOLS IN TWO OPERATIONS-ROUGH AND FINISH.							
SOLUTION - A NEW PROCESS IS BEING DEVELOPED THAT PERTAINES THE CRUSH FORM ABRASIVE MACHINE FOR CYLINDRICAL PARTS EXCEPT THAT THE PROCESS IS USED TO PRODUCE FLAT CONTOURED SURFACE. IT IS PROPOSED THAT THIS PROCESS BE ADAPTED TO PRODUCTION OF THE GAUDET SLOTT.							

MMT FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TUBES

(6151) TITLE - PORTABLE ENGRAVING SYSTEM

PROBLEM - CURRENTLY THE COMPONENT IDENTIFICATION LEGEND IS STAMPED BY HAMMER AND INDIVIDUAL ALPHANUMERIC STAMPS. THIS IS A TIME CONSUMING PROCESS WITH NO DEPTH CONTROL AND CAN PRESENT A SAFETY HAZARD TO PERSONNEL.

SOLUTION - PROVIDE A PROGRAMMABLE DATA ENGRAVING SYSTEM TO RELIEVE THE OPERATOR OF THE FATIGUE AND HAZARD OF HAND STAMPING. THIS WILL RESULT IN MORE UNIFORM SPACING AND DEPTH CONTROL AND REDUCE BOTH TIME AND COST.

(6152) TITLE - IMPROVED ANODE STRAIGHTNESS FOR CHROMIUM PLATING

PROBLEM - ANODE STRAIGHTNESS AND PIQUIDITY ARE IMPORTANT FOR MAXIMUM AND UNIFORM RADIAL DISTRIBUTION OF CURRENT. A SOLID COPPER ROD IS PRESENTLY USED. ALTHOUGH ANODES ARE MADE AND RESERVED AS CAREFULLY AS POSSIBLE STRAIGHTNESS IS A RECURRING PROBLEM.

SOLUTION - THIS PROJECT WILL USE IN THE COOPER ANODES A COMMERCIALLY AVAILABLE COMPOSITE ROD MADE OF UNIDIRECTIONAL GRAPHITIC FILAMENT IN A SUITABLE MATRIX. THE SPECIFIC STRENGTH WILL BE 33 TIMES HIGHER AND THE SPECIFIC MODULUS 9 TIMES HIGHER THAN COPPER.

(6153) TITLE - INCREASING GUN TUBE HEAT TREATMENT CAPACITY

PROBLEM - OIL-FIRED SELAS CONTINUOUS HEAT TREATING CANNOT MEET THE PRODUCTION CAPACITY OF THE ROTARY FORGE. THE OUTPUT OF THE HEAT TREAT LINE MUST BE INCREASED THREE-FOLD TO MEET MCFLILATION REQUIREMENTS.

SOLUTION - INCREASE CAPACITY BY MELTIFYING PRESENT SYSTEM, ADDING SECOND MCFLIFIED SYSTEM, ADDING A STAPLING FURNACE, AND SHORTENING AUSTENITIZATION CYCLE. ANOTHER POSSIBILITY IS TO USE RAPID HEATING RATES AVAILABLE WITH INDUCTION HEATING TO REDUCE TIME NEEDED.

(6241) TITLE - COMPUTER APPLICATIONS TO FORGE CURFANCE

PROBLEM - THE FORGE GUIDANCE SYSTEM CONSISTS OF MANY INTERDEPENDENT ELEMENTS MAKING IT DIFFICULT AND TIME CONSUMING TO DIAGNOSE PROBLEMS. ALSO, TURBES WITH LARGE WALL VARIATIONS GREATLY INCREASE THE DIFFICULTY IN MAINTAINING CONTROL.

SOLUTION - COMPUTER CONTROL WILL MAKE POSSIBLE SUCH FEATURES AS SELF TESTING, CHECKING, MONITORING, AND CALIBRATION IN CONTROL, TEST, AND MEASUREMENT SYSTEMS.

(6242) TITLE - DUAL PRESS LOADING

PROBLEM - ABOUT 20 PCT OF GUN TUBE FORMINGS REQUIRE STRAIGHTENING AT TEMPERATURES ABOVE 600 DEG F BECAUSE THE CURVATURE FOR "COLL" STRAIGHTENING ARE RELATIVELY TIGHT. SINGLE LOADING INDUCES STRESSES THAT CREATE MACHINING PROBLEMS.

SOLUTION - A TWO POINT LOADING DEVICE WILL BE DESIGNED WHICH WILL APPLY LOADS AT TWO POINTS, THUS REDUCING INDUCE STRESSES.

(CONTINUED)

64 171

MAT FIVE YEAR PLAN
MCS ORCAT 126

COMPONENT --- TILES	TITLE --- CONTINUE CHROMIUM PLATING PROCESS	FUNDING (\$000)					
		FFOR	61	62	63	64	65
(8243) TITLE - CONTINUE CHROMIUM PLATING PROCESS	CONTINUE	301	260				
PROBLEM - CHROMIUM PLATING OF CANON BARRELS IS A COMPLICATED, MULTI-STAGE PROCESS WHICH IS SIGNIFICANTLY CONTROLLED. MANUAL MANIPULATION OF VALVE STRESS, SWITCHES, ETC., IS SLOW, SOMETIMES HAZARDOUS, AND CAN RESULT IN DEGRADED DEPOSIT QUALITY DUE TO HUMAN ERROR.							
SOLUTION - THE CRITICAL STAGES OF THE CHROMIUM PLATING PROCESS WILL BE IDENTIFIED AND A FEW ANALYSTS (TITLES) DEVELOPED TO REDUCE TO NEAR ZERO THE MANUFACTURER'S FUNCTIONS RELATIVE TO AN OPERATOR.							
(8244) TITLE - UTILIZATION OF PLAT TREAT							
PROBLEM - ROTARY FORGE TUFFS ARE CURRENTLY HEAT TREATED BASED ON HISTORICAL DATA. IF THE INITIAL CYCLE DOES NOT RESULT IN ADEQUATE PROPERTIES ADDITIONAL CYCLES ARE REQUIRED UNTIL ACCEPTABLE PROPERTIES ARE ATTAINED.							
SOLUTION - INFORMATION ON EACH PLATE PERFORM TOGETHER WITH HISTORICAL DATA WILL BE USED TO DEVELOP A COMPUTER PROGRAM TO GENERATE HEAT TREAT PARAMETERS. THIS WILL GREATLY INCREASE THE PROBABILITY THAT THE REQUIRED PROPERTIES WILL BE OBTAINED ON THE FIRST CYCLE.							
(8245) TITLE - LOW CONCENTRATION (LC) CHROMIUM PLATING		241	195				
PROBLEM - HIGH CONCENTRATION CHROMIUM COATING IS CURRENTLY USED TO RESIST EROSION, IN GUN BARRELS. INHERENT PROPERTIES MAKE THE COATING SUSCEPTIBLE TO SHEARING AND FLAKING.							
SOLUTION - PLATING WITH LOW CONCENTRATION CHROMIUM WILL GIVE A MARKED INCREASE IN WEAR RESISTANCE BUT TO ITS SUPERIOR CHARACTERISTICS.							
(8246) TITLE - IMPROVED FINISHING OF GAS CHECK SEATS							
PROBLEM - MACHINING OF GAS CHECK SEATS IS A PRECISION PROCESS INVOLVING GRINDING AND LAPPING OF A CRITICAL AREA OF THE CAVAN WHICH RESULTS IN 30 TO 50 PERCENT TOLERANCE TO PASS CONTACT EDGE REQUIREMENTS.							
SOLUTION - APPLY MORE PRECISE ALIGNMENT OF FINISHING EQUIPMENT AND ELIMINATE THE MACHINING FACILITY WHICH TENDS TO INDUCE ECCENTRICITY. THE GAUGING SYSTEM WILL ALSO BE REVIEWED.							
(8247) TITLE - VACUUM MARKING OF FIRE CONTROL REGISTERS							
PROBLEM - DIFFICULTY IN MEASURING AND CORRECTLY MARKING THE FIRE CONTROL REGISTERS AT VARIOUS MFG CALIBER WEAPONS. INTRICATING COMPENSATION FOR MANUFACTURING VARIANCE OUT TO 1.125% ALLOWANCES.							
SOLUTION - PROVIDE AN ANALOG LEVELING MEASURING SYSTEM WHICH WILL PROVIDE INPUT DATA FOR A SERVOCONTROLLED JACKING SYSTEM TO POSITION LEVEL A TURRET AT THE MUZZLE AND A MEASURING SYSTEM FOR THE VARIATIONS AT THE BRIDLE LEVELING SPOT.							

PART FIVE VIBRANT PLAN
PDS URGENT 126

COMPONENT	TITLE	CONTINUITY	PRIORITY	FUNDING (\$000)			
				P-1	P-2	P-3	P-4
(8341) TITLE - HOLLOW CYLINDER CUT OFF MACHINE							
PROBLEM - ESTABLISH CYL LENGTH IS CONED IN OF 2 WAYS. PARTED OFF IN A LATHE AND FACED TO LENGTH OR SAWN OFF AND THEN SET UP IN A LATHE FOR FACING TO FINAL LENGTH DIMENSIONS. IN EITHER CASE, THE OPERATION REQUIRES DOUBLE HANDLING OF SLOW OPERATING PROCEDURES.							
SOLUTION - NEW TECHNOLOGY IS BEING DEVELOPED WHEREBY A SET OF ROTATING CUTTERS MILLS THE CYLINDER TO LENGTH EXECUTING A FACE SURFACE TO SATISFY OUR TUBE LENGTH REQUIREMENTS. CURRENT MACH. DESIGN WILL NOT PERFORM THIS FUNCTION BUT THE TECHNOLOGY IS APPLICABLE.							
(8345) TITLE - LASER CUTTING OF CANNON TUBES							
PROBLEM - AN INORDINATE AMOUNT OF TIME IS REQUIRED TO PERFORM CUTTING AND REMOVAL OF EXCESSIVE MATERIAL FROM CANON TUBES.							
SOLUTION - A LASER MACHINING PROCESS WITH SUFFICIENT OUTPUT ENERGY TO ACCOMMODATE LARGE WALL THICKNESSES WILL BE DEVELOPED.							
(8346) TITLE - PARTIAL REFRACTORY LINERS FOR CANON TUBES							
PROBLEM - MANUFACTURING PROBLEMS ARE ASSOCIATED WITH THE FABRICATION, MACHINING, AND ASSEMBLY OF THIN REFRACTORY LINERS INTO CANON TUBES.							
SOLUTION - DEVELOP NEW TECHNIQUES AND MANUFACTURING PROCESSES TO SOLVE THESE PROBLEMS.							
(8346) TITLE - DEDUCING OF RIGID EVACUATOR BELTS							
PROBLEM - AT INABILITY TO SUCCESSFULLY AND CONSISTENTLY PRODUCE A SMOOTH RADIAL TO THE INTERNAL PEVING OF THE RIGID EVACUATOR BELTS OF THE 120MM HAS LFI TO FAIRLY CHRONIC FAILURE.							
SOLUTION - A INTERNAL FIXTURE ACTING AS A CARRIER FOR THE ANODE AND SOLUTION INJECTION AND FABRICATE. THE UNIT WILL BE CAPABLE OF DURARING THE INTERNAL AREA OF THE EVACUATOR BELTS BY USE OF ELECTRO-CHEMICAL POLISHING.							
(8347) TITLE - AUTOMATIC PIPLING HEAD ALIGNMENT							
PROBLEM - ALIGNMENT OF THE PIPLING HEAD IS A TIME CONSUMING MANUAL OPERATION REQUIRING SIGNIFICANT SKILL TO DIFFERENTIATE GUN FOR POSITION RELATIVE TO THE PERIPHERY OF THE SURFACE PIPLING CUTTER HOGGY.							
SOLUTION - APPLICATION OF AN AUTOMATIC PIPLING POSITIONING SYSTEM. THE OPTIMAL EFFECT WITH SUBSTANTIALLY REDUCE THIS OPERATION.							

201 FIVE YEAR PLAN
MAY 1987 126

CHRONOLOGY -- TURBES

(CONTINUED)

Project Title - MULTIPLE HOLLOW SHRINKING

PROBLEM - Present shrinking fitting of pipes onto 8" CANNON TUBES IS ACCOMPLISHED OFF-HAND AT A TIME. THIS INVOLVES INDUCTION HEATING OF THE HOLLOW TUBE AND SPRAY COOLING TO SHRINK.

SOLUTION - A VERTICAL SYSTEM TO SIMULTANEOUSLY LOWER THE THREE HOLES WITH INDUCTION COILS AND LOCATE POSITION AS THE TUBE IS LOWERED INTO THE PIT WILL BE DESIGNED AND FACILITATED. WATER COOLING SYSTEM WILL BE DESIGNED TO SPEED UP COOLING OF THE PART.

Project Title - INTRAVUE HOLLOW SPINDLE LOADING & UNLOADING

PROBLEM - LOADING AND UNLOADING OF GUN TUBES IN HOLLOW SPINDLE LATHE REQUIRES TWO CRANE LIFTS AND TWO MANUAL MOVES BY THE OPERATOR THAT IS POTENTIALLY HAZARDOUS.

SOLUTION - A CRANELESS DESIGN THAT WILL AUTOMATICALLY LOAD THE TUBE INTO POSITION ■ IT IS BEING DESIGNED, FABRICATED AND FITTED TO PRODUCTION HOLLOW SPINDLE LATHE.

Project Title - INP RFG QUANTUM FLATS & WHEEL PHAKE

PROBLEM - FREQUENT METALS OF MACHINING FLATS AND KEYWAYS REQUIRE TWO SET-UPS ON TWO SEPARATE MACHINE TOOLS WITH ATTENDANT MATERIAL HANDLING REQUIREMENTS.

SOLUTION - DESIGNS A RUGGED MACHINING SYSTEM CASABLE OF MANUFACTURING BOTH THE KEYWAY AND THE LEVELING FLATS IN A SINGLE SET-UP. FABRICATE AND RETROFIT TO CURRENT EQUIPMENT.

Project Title - SKIVING OF GUN TUBE BORES

PROBLEM - INTERMITTENT TUBE BORING OPERATIONS FOR SURFACE FINISH AND TUBE CENTERLINE ARE A TIME CONSUMING, COSTLY METAL REMOVAL PROCESS. CENTERHOLDING OPERATIONS PRIOR TO SWAGE AUTOFRITACE ARE ALSO SLOW, TIME CONSUMING, AND HIGH IN TOOLING COSTS.

SOLUTION - THIS APPLICATION OF RECENTLY DEVELOPED SKIVING TECHNOLOGY AND EQUIPMENT WILL ELIMINATE COSTLY DOUGH HAVING CENTERHOLDING OPERATIONS.

Project Title - AUTO FLAME CUTTING OF HOT FORGED TUBES

PROBLEM - CUT OFF OF NOZZLE AND EFFECTIVE OF RECTANGULAR FORGED FORGINGS IS A TIME SICK OPERATION PRIOR TO HEAT TREATING.

SOLUTION - AUTOMATIC FLAME CUTTING WILL LIMITATE A POSSIBLE NICK OPERATION AND PREVENTING TUBE

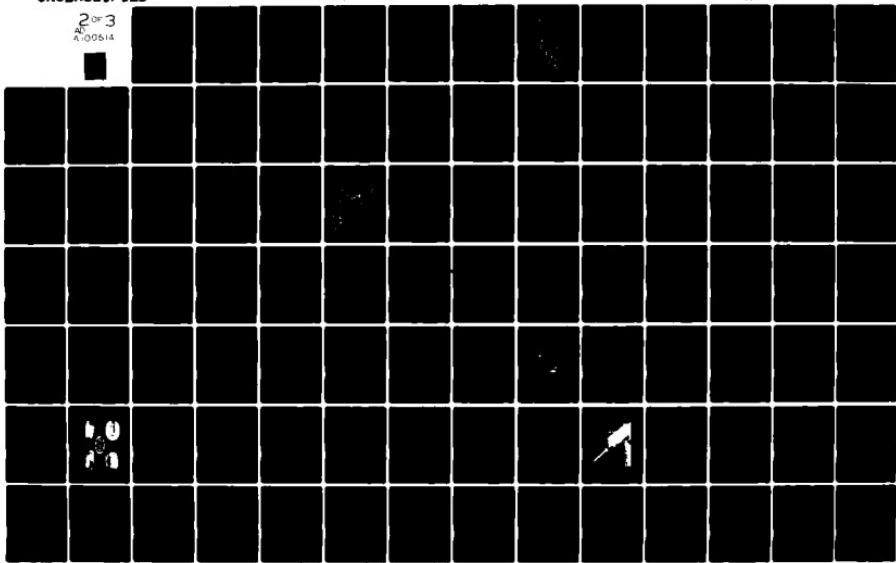
PROJECT	FUNDING (\$000)				
	E1	E2	E3	E4	E5
1. TURBES	450	400			
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MANUFACTURING METHODS & TECHNOLOGY PROGRAM PLAN, CY 1981.(U)
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2 of 3
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MAT FIVE YEAR PLAN
RCS DRMT 126

COMPONENT -- TYPES	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)			
				PRIOR	R1	R2	R3
* * * * *							
(R3C) TITLE - CARBON/CARBON COMPOSITE STIFFENED LARGE CALIBER GUN TUBES	4 CONTINUED)	PROBLEM - REDUCED WEIGHT WITHOUT PRODUCT OF ACCURACY. GRAPHITE FIRER REINFORCED COMPOSITE TUBE STIFFENERS CAN DECREASE WEIGHT AND IMPROVE ACCURACY. THE EPOXY MATRIX MATERIAL CAN NOT SUSTAIN THE HIGH TEMPERATURE PRODUCED BY REPEATED RAPID FIRINGS.	SOLUTION - CARBON/CARBON COMPOSITES ARE STABLE TO TEMPERATURE FAR IN EXCESS TO THAT OF STEEL. A NEW MATRIX PRECURSOR IMPREGNANT REDUCES PROCESSING REQUIREMENTS SIGNIFICANTLY. THUS MAKING CARBON/CARBON COMPOSITES A COST COMPETITIVE MATERIAL.	356	300	200	
(R421) TITLE - CONTOUR CHEMICAL MILLING PROCESS FOR GUN TUBE FAR.		PROBLEM - NO PROBLEM PROVIDED BY AFRA/COM.	SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.	278	220		
(R423) TITLE - L/M FABRICATION OF GUN TUFTS		PROBLEM - MANUFACTURE OF BARRELS USING IMPROVED MATERIALS WITH RESISTANCE TO WEAR AND EROSION CAUSED BY THERMAL AND CHEMICAL DETERIORATION DESIGNED FOR USE AT ELEVATED TEMPERATURES. UNDER ADVERSE CONDITIONS BY CONVENTIONAL TECHNIQUES IS EXPENSIVE.	SOLUTION - ROTARY SWAGING OF COMPACTED PREFORMS HAS BEEN DONE FOR IRON POWDER COMPACTION IN R&D LABS. THIS TECHNIQUE CAN BE EXTENDED TO FABRICATE PRECISION GUN BARRELS FROM LOW ALLOY-HIGH STRENGTH STEEL POWDERS.	200	300		
* * * * *							
COMPONENT -- MISCELLANEOUS		CATEGORY	POLLUTION ABATEMENT				
(R12E) TITLE - SEPARATION OF OILS AND CUTTING FLUIDS FROM WASTE WATER		PROBLEM - REMOVAL OF OILS AND CUTTING FLUIDS FROM WASTE WATER IS NECESSARY TO MEET EPA REQUIREMENTS.	SOLUTION - EVALUATE CHEMICAL AND MECHANICAL METHODS FOR OIL AND CUTTING FLUID REMOVAL FROM WASTE WATER.				
* * * * *							

FIVE YEAR PLAN
FCS FRCM 126

COMPONENT	-- FIRE CONTROL	(P&S)	TITLE - DIGITAL IMAGE CLASSTHERMIC TECHNIQUES	FUNDING (\$000)			
				PRIOR	R1	R2	R3
							R5
							350
COMPONENT	-- GUN SYSTEMS	(P&S)	TITLE - IMPROVE IMPULSE PROGRAMME FOR HYDRAULIC SIMULATOR				R0
			PROBLEM - UNTESTABLE SHOCK AND VIBRATION IN TESTS OF CERTAIN RECOIL MECHANISMS LIMIT THE EXTENT OF TESTING THAT CAN BE ACCOMODATED ON THE HYDRAULIC ARTILLERY TEST SIMULATOR.				
			SOLUTION - DESIGN AND MANUFACTURE IMPROVED IMPULSE PROGRAMMES TO GET BETTER SIMULATED FIRING THAT WILL BE MORE EFFECTIVE FOR A GREATER NUMBER OF WEAPONS.				
		(P&S)	TITLE - AUTOMATIC ADJUSTMENT FOR SIMULATOR ARTILLERY TEST				100
			PROBLEM - HIGH OPERATING COSTS DUE TO NECESSITY OF MANUAL ADJUSTMENT OF VALVES AND OF SPACING BETWEEN SIMULATOR AND WEAPON.				
			SOLUTION - PROVIDE INCREASED TEST EFFICIENCY BY PROVIDING REMOTE AND AUTOMATIC ADJUSTMENT OF SIMULATOR SPACING TO WEAPON, AND FOR AUTOMATIC ADJUSTMENT OF PRECHARGE PRESSURES.				
		(P&S)	TITLE - ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)				100
			PROBLEM - EXISTING INSPECTION METHODS ARE TIME CONSUMING AND DIFFICULT TO PERFORM. FEASIBILITY OF AUTOMATIC MEASUREMENT (OF DIMENSION, HARDNESS, AND SURFACE CHARACTERISTICS HAS BEEN SHOWN BUT HAVE NOT BEEN APPLIED IN SMALL CALIBER WEAPONS MANUFACTURE.				
			SOLUTION - REPLACE THE MANUAL HANDLING AND THE X-RAY FILM. THE GUN CARRIAGE SUCH AS SEPHLIFES AND THE X-RAY SOURCE BY AN AUTOMATED ROBOTICS DEVICE TO ALIGN AND INSPECT THE GUN CARRIAGE HELDS.				
		(P&S)	TITLE - AUTOMATED INSPECTION OF WEAPONS COMPONENTS				378
			PROBLEM - NO PROBLEM PROVIDED BY AFRAACOM.				
			SOLUTION - NO SOLUTION PROVIDED BY AFRAACOM.				
							360

MMI FIVE YEAR PLAN
RCS DRCMT 126

MMT FIVE YEAR PLAN
BCCS DBCEMT 126

EINDELMIC 130001

PRIOR 81 82 83 84 85
FUND INC (\$000)

COMBINATION -- MISCELLANEOUS

MEASUREMENTS AND DIAGNOSTICS

PROBLEM - VIBRATIONS IN MACHINE TOOLS. KNOWN AS CHATTER, CAN BE THE CAUSE OF POOR MACHINING OPERATIONS WHICH, IN A HIGH PRODUCTION ENVIRONMENT, CAN RESULT IN MUCH LOST TIME AND DOLLARS.

SOLUTION - DEVELOP A MACHINE TOOL DYNAMIC MEASUREMENTS TECHNIQUE WHICH USES VIBRATION SIGNALS RECEIVED FROM VARIOUS MACHINE LOCATIONS AND IDENTIFIES THE ORIGIN AND MAGNITUDE OF THE VIBRATION. VIBRATION ANALYSIS WOULD INDICATE CORRECTIVE ACTION.

***** C A T E G O R Y *****

BACHELOR'S

17985) TITLE - SMALL ARMS WEAPONS NEW PROCESS PRODUCTION TECHNOLOGY

PROBLEM - GUN BARREL MFG. FROZEN DUES REFLECT ANTICUTTED TECHNOLOGY AND RELY ON MASS REMOVAL OF MATERIAL BY CONVENTIONAL MACHINING METHODS. CURRENT EQUIP. PRESENTS INACCURACIES IN MATERIALS COMMANDING THE PROGRAM.

SOLUTION - REDUCE TO PRACTICE NEW TECHNIQUES FOR CAL = 0 TO 40MM BARRELS BY ESTABLISHING THE TECHNIQUES AND PROCESS EQUIPMENT REQUIRED TO BRIDGE GAP BETWEEN CAPABILITIES AND REQUIREMENTS

PROBLEM - CHROMIUM PLATING IS A RELATIVELY SLOW PROCESS.

SOCIAL SECTION — POLITICAL SCIENCE

246
175
8162) TITLE - IMPROVED SC GUN BARREL RIFLING MFG TECHNIQUES

PROBLEM - RIFLING SMALL CALIBER CAN EARLLS USES ANTIQUATED TECHNOLOGY (C. 1940-50). AS MANY AS 24 PASSES WITH LASER TYPE PROACHE ARE NEEDED. EACH PASS REQUIRES DISASSEMBLY OF STI-UF. EQUIPMENT IN CAL. 50 TO 40MM SIZE IS EXTREMELY LIMITED.

SOLUTION - AFFLY AND REFORCE TO FACTICE THE CONCEPT OF ULTRASONIC EXCITATION OF RIFLING FORMING TOOLS. THE USE OF ULTRASONICS FOR RIFLE FORMING WILL RESULT IN REDUCED TOOLS TO FORM RIFLING. IMPROVED FINISH CHARACTERISTICS. AND REQUIRE FEWER PASSSES.

WEST POINT WEAPONS PLAN
FCI - THRU 126

FUNDING (\$1000)

COMPONENT -- BARRELS

(CONTINUED)

(F44) TITLE - HIGH SPEED MACHINING OF WEAPONS COMPONENTS

PROBLEM - MACHINING SMALL CALIBER WEAPONS COMPONENTS BY CONVENTIONAL METHODS REQUIRES Considerable TIME AND IS THE MAIN PORTION OF ITEM COST. ALSO, INDIVIDUAL MACHINE OPERATIONS ARE PERFORMED ON SEPARATE MACHINES REQUIRING EXTENSIVE MATERIAL HANDLING.

SOLUTION - HIGH SPEED METAL REMOVAL AND THE COMBINATION OF OPERATIONS FOR STEEL COMPONENTS OF SMALL CALIBER WEAPONS WILL BE INVESTIGATED. BENEFITS FINISH, INCLUSED. THIS A/C COST, IMPROVED TOOL LIFE, AND IMPROVED SURFACE FINISH.

(F4471) TITLE - INVESTMENT CAST LINERS OR SUBSTITUTE ALLOYS

PROBLEM - AN ALTERNATE INVESTMENT-CAST GUN TUBE LINER MATERIAL IS REQUIRED TO SERVE AS A BACKUP AND/OR REPLACEMENT FOR THE CURRENT STRATEGIC COBALT-BASE INVESTMENT CAST ALLOY.

SOLUTION - ESTABLISH VACUUM MELTING AND CASTING CAPABILITIES FOR THE INVESTMENT CASTING OF GUN TUBE LINERS.

(F4472) TITLE - ROTARY FORGING OF GUN BARRELS

PROBLEM - NO PROBLEM PROVIDED BY AFRAACOM.

SOLUTION - NO SOLUTION PROVIDED BY AFRAACOM.

(F4474) TITLE - REFRACTORY METAL COATING FOR GUN TUBES

PROBLEM - THERE IS A NEED TO PROVIDE IMPROVED RAPID FIRE GUN TUBES, AND A NEED TO REPLACE LINER MATERIALS (HALF OF COBALT AND ITS ALLOYS (A CRITICAL STRATEGIC MATERIAL).

SOLUTION - DEVELOP AND OPTIMIZE THE PROCESS VARIABLES OF THE REFRACTORY METAL COATINGS AND THE APPLICATION PROCEDURES OF THESE COATINGS ON GUN BARREL LINERS.

COMPONENT -- COMPONENTS

(F4471) TITLE - SQUEEZE CASTING OF SMALL CAL WEAPONS

PROBLEM - NO PROBLEM PROVIDED BY AFRAACOM.

SOLUTION - NO SOLUTION PROVIDED BY AFRAACOM.

PRIOR
#1
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PRIOR
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290
266
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83
84
85

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208

275
325

290

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430

MPT FIVE YEAR PLAN
RCS CRCBT 126

FUNDING (\$000)

COMPONENT	TITLE	APPLICATION AND CONTROL OF MACHINE TOOLS	PRIOR	81	82	83	84	85
(81-1) TITLE -- GENERAL				100	85			
	PROBLEM - CURRENT PROCEDURES FOR THE JUSTIFICATION, SELECTION, APPLICATION, AND MAINTENANCE OF MACHINE TOOLS ARE INADEQUATE TO AVOID PROCUREMENT OF INEFFICIENT, UNRELIABLE MACHINE TOOLS.							
	SOLUTION - ESTABLISH AN ACCURATE DEFINITION OF MACHINE TOOL REQUIREMENTS IN RELATION TO CONFORMANT MACHINING REQUIREMENTS. DEVELOP PERFORMANCE ANALYSES AND COMPETITIVE PERFORMANCE EVALUATION CRITERIA.							
(81-3) TITLE - FM STEEL PREFORMS FOR SMALL CALIBER WEAPONS								180
	PROBLEM - MANUFACTURE OF WEAPONS COMPONENTS SUCH AS BOLTS AND SPROCKETS HAVE BEEN BY CONVENTIONAL METAL REMOVAL PROCESSES. WHILE NC EQUIPMENT REDUCES MACHINING TIME, EQUIPMENT COSTS ARE HIGH AND MUCH MATERIAL WASTE OCCURS.							
	SOLUTION - FM OFFERS A MEANS OF ACHIEVING NEAR NET SHAPE AT LOW COST. P/M PREFORM APPROACH HAS BEEN SHOWN FOR SIMPLE SHAPES. RECENT ADVANCES IN P/M TECHNOLOGY HAVE DEMONSTRATED THE CAPABILITY OF MANUFACTURING P/M PREFORMS IN COMPLEX SHAPES.							
(83-4) TITLE - PROCESS CONTROLS FOR P/M LEAFING COMPONENTS								195
	PROBLEM - PRESENT METHODS OF PRODUCING WEAPON COMPONENTS IS MAINLY BY MACHINING FROM WROUGHT STOCK. THIS IS A HIGH COST METHOD WHICH PRODUCES MUCH ALLOY STEEL SCRA.							
	SOLUTION - FORGE PARTS FROM P/M STEEL FOR SAVINGS AND INCREASED DURABILITY AND REDUCED USE OF ALLOY STEEL.							
(84-6) TITLE - ASSEMBLY & HANDLING TECHNIQUES FOR SMALL CAL WEAPONS								320
	PROBLEM - NO PROFILE PROVIDED BY ARRACOM.							
	SOLUTION - NO SOLUTION PROVIDED BY ARRACOM.							
(85-6) TITLE - CIRCUIT TECHNOLOGY FOR S/C COMPONENT								300
	PROBLEM - NO PROFILE STATEMENT PROVIDED BY ARRACOM.							
	SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRACOM.							
(85-6) TITLE - PROCESSING OF HIGH STRENGTH/LIGHT WEIGHT WEAPONS COMPONENTS								510
	PROBLEM - NO PROFILE STATEMENT PROVIDED BY ARRACOM.							
	SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRACOM							

NET FIVE YEAR PLAN
CHC# 126

FUNDING (\$000)

PRIOR E1 E2 E3 E4 E5

300

(CONTINUED)

COMPONENT -- GENERAL

(E5.1) TITLE - FRAGILIZATION OF COMPOSITE WEAPON COMPONENTS

PROBLEM - CONVENTIONAL WEAPONS HAVE SURFACE COATINGS ARE APPLIED BY ELECTRO-PLATING AND ARE OFTEN CRITICAL. HAVE VARIABLE COMPOSITION AND STRUCTURE AND ARE LIMITED IN APPLICATION BY GEOMETRICAL CONSTRAINTS.

SOLUTION - PREDICTING THE USE OF MULTI-LAYER MATERIALS (COPPER ALLOY/STEEL) PRODUCED BY THE P/S PROCESS WHICH ARE CURRENTLY BEING USED FOR HEAVINGS TO FORM WEAR AND EROSION RESISTANT LAYERS.

(E5.2) TITLE - LIGHTWEIGHT FOR WEAPON COMPONENTS

PROBLEM - MODERN WEAPONS REQUIRE THAT MATERIALS HAVE A HIGH SPECIFIC STRENGTH & STRENGTH TO DENSITY RATIO IN ORDER TO REDUCE THEIR WEIGHT.

SOLUTION - THE US NAVY HAVE DEVELOPED METAL MATRIX COMPOSITE MATERIALS THAT HAVE HIGHER SPECIFIC STRENGTHS THAN STEEL OR ALUMINUM ALLOYS. DEVELOP THE PROCESSING PARAMETERS FOR MANUFACTURING THESE MATERIALS INTO WEAPON COMPONENTS.

(E5.3) TITLE - COLD FORGING OF EQUAL-CALIBER WEAPON COMPONENTS

PROBLEM - NO PROCESS PROVIDED BY PRELICENSING.

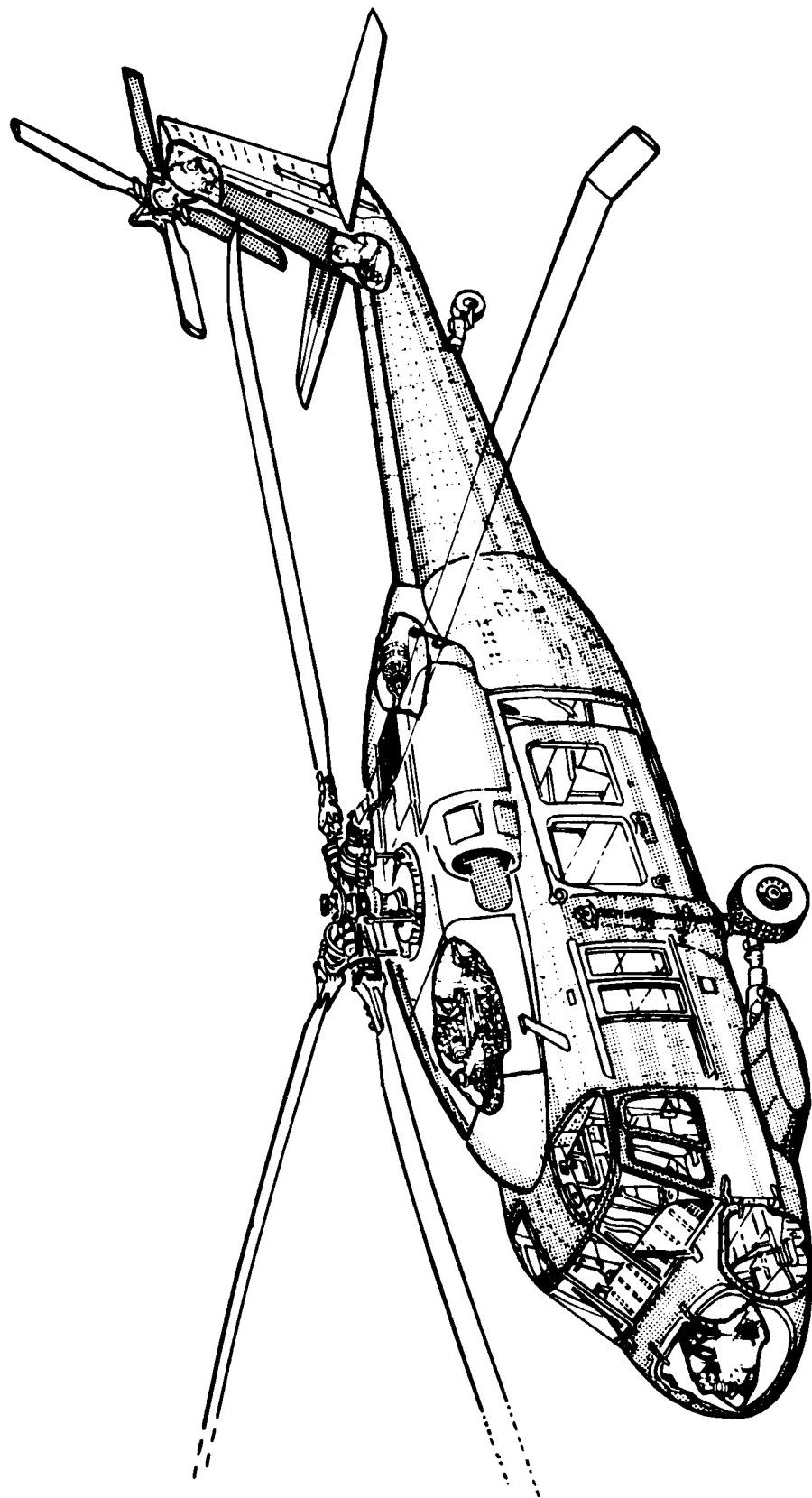
SOLUTION - A SOLUTION PROVIDED BY AIR FORCE.

COMPONENT -- SPRINGS

(E5.7) TITLE - STRONGENESS OF METALLIC COMPRESSION SPRINGS

PROBLEM - THE FATIGUE LIFE AND RELIABILITY OF CRITICAL SPRINGS IN SOME WEAPON SYSTEMS IS LESS THAN DESIRABLE.

SOLUTION - IMPROVE THE FATIGUE LIFE AND RELIABILITY OF THE WEAPON SPRINGS BY OPTIMIZING THE PRODUCTION PROCESSES FOR METALS SUCH AS SHOT SIZE, SHOT INTENSITY, AND SPRING STRESS LEVEL.



AVIATION R&D COMMAND
(AVRADCOM)

<u>CATEGORY</u>	<u>PAGE</u>
Airframe-----	108
Avionics-----	112
Drive System-----	113
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US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
(AVRADCOM)

The US Army Aviation Research and Development Command (AVRADCOM), with headquarters at St. Louis, MO, is responsible for Army aviation research, development, product improvement, acquisition of assigned materiel, initial procurement, and production. The Command directs the Research and Technology Laboratories with headquarters at NASA - Ames Research Center, Moffett Field, CA; US Army Avionics Agency and Laboratory, Fort Monmouth, NJ; Applied Technology Laboratory at Ft. Eustis, VA; US Army Bell Plant Activity, Fort Worth, TX; and the US Army Hughes Plant Activity, Culver City, CA. Three project managers, Aircraft Survivability Equipment, CH-47 Modernization Program, and Navigation/Control Systems, are located at AVRADCOM. PM Advanced Attack Helicopter (AAH) and PM Blackhawk are located at AVRADCOM, but are under the direct control of HQ, DARCOM.

The overall emphasis of the Army's aviation MMT program is to perfect technologies which have a good probability of implementation and high potential benefits. For the most part, efforts are directed towards projects which offer both cost reductions and product improvements. The results of these projects will be made available to other Government agencies and to Industry.

The most important criteria of aircraft materials are strength and low weight. A large part of the aviation MMT program is dedicated to establishing processes to replace metals with materials which have better strength to weight ratios. Composite materials suitable for aviation have been developed and are being used; however, techniques for the production and application of composites need further development to achieve increased use.

The use of composite materials in Army aircraft is anticipated to increase as a result of current work in R&D and MT leading to an all-composite helicopter fuselage. Raw material costs are expected to decrease with the increased use of composites in DOD and Industry. Also, as confidence in the use of composites increases, reservations held by the design and (quality control groups) will diminish, and composites will be incorporated in the earliest stages of weapon development. This will result in increases in MMT work.

Composite projects are planned for virtually every part of the helicopter. Several projects are planned in the airframe area. One will establish manufacturing methods for application of composites to a main fuselage primary structure (the rear fuselage of the Blackhawk). A project planned in the rotor area will establish a manufacturing process for the main rotor blade of the Blackhawk. In the drive area, one project will focus on the drive shaft and another will result in methods for manufacturing a gearbox housing.

Several projects will attack technical problem areas that affect all composite manufacturing. These projects address automation of cutting and layup operations, and improvements in machining, fastening, and new materials. The development of automated techniques will be pursued in cooperation with the Air Force, the lead service in this area.

Perhaps the most significant project areas in terms of advancing composites manufacturing and usage is in the development of improved and new quality control techniques. Projects planned in this area will address materials characterization, in-process controls, and non-destructive evaluation. These projects will ensure optimum processing and material performance, which will increase confidence in composites.

There are many areas in aircraft in which metals can not be replaced. Projects have been submitted to improve production of these items. Since many aircraft metals used in the propulsion system are tough and expensive, machining to final shape is difficult and produces costly scrap. Improving powder metal technology will provide components much closer to final shape, greatly reducing the time and effort to produce the final product. Several projects are included to implement recent advances in gear manufacturing and should provide an improved item at a lower cost. Projects are also planned to find ways of repairing rather than scrapping complex items which are damaged in the manufacturing process. An effort is planned to replace metal turbine blades with ceramic blades. This will provide better operating characteristics at lower cost.

C U R R E N T F U N D I N G S U M M A R Y
(THOUSANDS)

AVRAU.COM

CATEGORY	FY81	FY82	FY83	FY84	FY85
AIRCRAFT	3222	2092	860	3330	5135
AVIONICS	700	256	0	515	600
DRIVE SYSTEM	£69	1149	3045	4215	5130
GENERAL	0	6	200	220	0
ROTOR SYSTEM	2624	4100	3250	1225	2100
TURBINE ENGINE	2437	5416	7890	8320	6520
TOTAL	9843	13004	15285	17825	19685

YARD, YARD, YARD
TICKET 124

FWD. IN. (3-1)

PFT04 P1 P2 P3 P4

(71) 2) TITLE - DESIGN ANY STRUCTURE

PROBLEM - INTEGRATED DESIGN OF HIGH STRENGTH PLASTIC STRUCTURES WITH CURVED AND HIGH ASYMETRIC GEOMETRIES. MOST OF THESE ARE COMPLEX AND INVOLVED INVESTIGATION OF MANUFACTURING PROCESS.

SOLUTION - USE EQUIPMENT AND TECHNOLOGIES DEVELOPED BY INDUSTRY IN SUPPORT OF AIR FORCE COMPOSITE COMPONENT PROGRAM. THE SELECTED SYSTEM WILL BE UNIFORM AND ACCURATE HELICOPTER COMPONENTS WHICH ARE MORE COMPLEX AND HAVE A RE-CURVATURE THAN AF CCR.

(72) 2) TITLE - DESIGN FOR HELICOPTER SECONDARY STRUCTURES

PROBLEM - FIBER REINFORCED THERMOPLASTIC COMPONENTS INTO COMPLEX, OUTLICURVED STRUCTURAL CONFIGURATIONS. WITH UNIDIR FIBER DISTRIBUTION. STIMULUS WASHAGE. AND ACCEPTABLE FINISHES HAS NOT BEEN ESTABLISHED FOR AIRCRAFT COMPARTMENTS.

SOLUTION - EFFORT WILL ESTABLISH TECHNIQUES, SPECIAL TOOLING, AND PROCESSES TO FORM SUCH COMPONENTS WITH VACUUM OR AIR PRESSURE ASSIST METHODS. IN EFFECTIVENESS, WHICH GOES TO RESTRAIN THE NATURAL AN. FIBER LAYERS IN POSITION DURING HEAT-UP CYCLE WILL BE ESTABLISHED.

(73) 2) TITLE - MIN SIZING OF LOW COST SECONDARY STRUCTURES

PROBLEM - PRESENT METHODS OF FABRICATING AIRCRAFT SECONDARY STRUCTURES (ESPECIALLY ACCESS PANELS) INVOLVE EXPENSIVE, LABOR AND EXPENSIVE MATERIALS. STRUCTURES ARE MADE FROM FIBER REINFORCED CARBON/GRAPHITE AND/OR FORGED SHEET METAL AFTER REQUIR COMPLEX ASSEMBLY.

SOLUTION - ESTABLISH A PROCESS TO FABRICATE THESE SECONDARY STRUCTURES FROM REACTIV INJECTED POLY(1,4-METHYL) RIM. THIS IS A LOW PRESSURE MOLDING TECHNIQUE WHICH CAN USE LOW COST COMPOSITE MOLDS TO GIVE EXTREMELY COST EFFECTIVE STRUCTURES.

(74) 2) TITLE - FIBER REINFORCED THERMOPLASTIC INLET

PROBLEM - MULTIPLE CONVENTIONAL TO SHAPES SUCH AS THAT OF THE BLACK HAWK INLET IN PRODUCTION HAS NOT BEEN DEMONSTRATED.

SOLUTION - ESTABLISH A PROCESS - MOLDING PROCESS FOR MANUFACTURING AN INLET CONPOSED OF ALUMINUM GLASS FIBERS IN A POLYANILINE MATRIX.

(75) 2) TITLE - FIBER REINFORCED THERMOPLASTIC STRUCTURE

PROBLEM - HELICOPTER SECONDARY AIRFRAME STRUCTURES ARE EXPENSIVE AND A MAJOR PROBLEM IS THE COST OF TOOLING. THE CONVENTIONAL PROCESS AND REPLACEMENT OF THESE

SOLUTION - ESTABLISH A PROCESS TO INTEGRATE HIGH STRENGTH AND HIGH MODULUS FIBERS INTO THE QUALITATIVE FOR HELICOPTER STRUCTURES.

NET FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	TITLE	FUNDING (\$000)			
		PRIOR	E1	E2	E3
STRUCTURAL MEMBERS	47153) TITLE - 40V FILAMENT WINDING FOR AIRCRAFT COMPONENTS	85	85	85	85
	PROBLEM - CURRENT COMMERCIAL PRACTICES ON FILAMENT WINDING ARE EXPENSIVE.				350
	SOLUTION - A NUMBER OF RECENT DEVELOPMENTS IN FILAMENT WINDING TECHNOLOGY ORIGINATING IN THE U.S., DENMARK AND HUNGARY SHOW PROMISE OF EXPANDING THE FLexIBILITY OF THE FILAMENT WINDING PROCESS.				
STRUCTURAL MEMBERS	47342) TITLE - PULTRUSION OF HIGH-EYCOMB SANDWICH STRUCTURES	85	200	92	
	PROBLEM - Fabrication of honeycomb sandwich panels is labor intensive and face-to-face economy often takes two cure iterations. Pultrusion can be used for continuous production, but dimensional parameters and tooling are not suitable for military use.				
	SOLUTION - ESTABLISH TECHNOLOGY NECESSARY FOR PRODUCTION PULTRUSION OF SANDWICH STRUCTURES, INCLUDING BEAMS, FOR USE IN COMPOSITE AIRFRAMES. PARAMETERS WILL BE GENERATED AND OPTIMIZED FOR PULTRUDING MILITARY QUALITY FLOORING.				
TITANIUM	47377) TITLE - SAME PUNCH OF TITANIUM	300	250		
	PROBLEM - MANY AIRFRAME PARTS CONSIST OF MULTIPLE DETAILS RIVETED OR SPOT-WELDED TOGETHER THAT INCREASE THE FORMING CYCLE, TOOLING COSTS, AND LABOR. ALSO, MANY PART CONTOURS ARE IMPOSSIBLE TO FORM BY CONVENTIONAL METHODS.				
	SOLUTION - THIS PROJECT WILL DEVELOP A "SAME PUNCH" METHOD OF SUPERPLASTICALLY FORMING TITANIUM ALLOYS AS A PRACTICAL, ECONOMICAL PRODUCTION METHOD.				
STRUCTURAL COMPONENTS	47378) TITLE - BI-MATERIAL CARBON-CARBON STRUCTURAL COMPONENTS	450	300		
	PROBLEM - RECENT ADVANCES IN THE DEVELOPMENT OF LASER WEAPONS HAVE REAPPRAISED THE TRIVIT, FOR THE INTRODUCTION OF LASER TACTICAL WEAPONS.				
	SOLUTION - THIS PROJECT WILL DEVELOP THE MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION AND RETROFIT OF BI-MATERIAL CARBON-CARBON STRUCTURAL COMPONENTS. BI-MATERIAL C-C IS A HIGH STRENGTH LIGHTWEIGHT INTEGRAL HIGH ENERGY LASER PROTECTIVE PARASITE SYSTEM.				
ALUMINUM	47399) TITLE - SUPERPLASTIC FORMING OF ALUMINUM COMPONENTS	300	400	200	
	PROBLEM - CURRENT METHODS OF MANUFACTURING ALUMINUM FORGINGS ARE EXPENSIVE AND REQUIRE AN EXCESSIVE NUMBER OF STEPS.				
	SOLUTION - ESTABLISH FABRICATION TECHNOLOGY NECESSARY TO MANUFACTURE ALUMINUM AIRFRAMING COMPONENTS, THRU THE UTILIZATION OF SUPERPLASTIC FORMING OF ALUMINUM ALLOY SHEET MATERIAL.				

FUNCTING (S000)

CONVENTIONAL -- STRUCTURAL MEMBERS

(CONTINUED)

(7414) TITLE - JOINING OF REIN. THERMOPLASTIC COMPOSITE STRUCT

PROBLEM - UTILIZATION OF FIBER REINFORCED THERMOPLASTIC RESIN SYSTEMS TO FORM STRUCTURAL ELEMENTS CURRENTLY JOINED BY ADHESIVE BONDING WHICH TAKES HOURS TO CURE.

SOLUTION - USE LOW COST EFFECT MATERIAL JOINING METHODS SUCH AS ULTRASONIC SAW OR SPOT WELDING, DIRECT THERMAL FUSION, ETC FOR REINFORCED THERMOPLASTIC STRUCTURAL ELEMENTS.

CONVENTIONAL -- STRUCTURAL PANELS

(7415) TITLE - POLYIMIDE FOAM FOR MULTIFUNCTIONAL AIRCRAFT STRUCT

PROBLEM - NYLON/POLYIMIDE FOAM HAS BEEN DEVELOPED AS A STRUCTURAL COAT FOR MULTIFUNCTIONAL AIRCRAFT SANDWICH STRUCTURES. CHOPPED GLASS AND GRAPHITE ARE INCORPORATED INTO THE FOAM TO GIVE REQUIRED CHARACTERISTICS. PRODUCTION IS HIGH COST WITH LARGE VARIATIONS.

SOLUTION - AN AUTOMATIC FOAM DISINTEGRATING UNIT WILL BE COMBINED WITH HONEYCOMB FORMING AND SHAPING EQUIPMENT TO FORM CURVED OR COMPLEX SHAPED HONEYCOMB CORE WITH CURED POLYIMIDE FOAM IN PLACE. MICROWAVE, RF, OR FORCED AIR WILL BE USED FOR CURE CURING.

(7416) TITLE - PLATE HELD WATER JET CUTTING

PROBLEM - CONVENTIONAL METHODS OF CUTTING FLAT AND FORMED COMPOSITE AND METALLIC PANELS RESULTS IN SEVERE TOOL WEAR AND HIGH DUST LEVELS. WHEN USED ON KEVALAR FUZZING OF EDGES OCCURS RESULTING IN SECONDARY OPERATIONS.

SOLUTION - THIS PROJECT WILL DEVELOP A HAND HELD WATER JET CUTTER TO BE USED FOR CUTTING COMPOSITES.

* C A T F C C Y *

* AVIATION *

CONVENTIONAL -- DISPLAYS

(7417) TITLE - MULTI-LEGEND DISPLAY SWITCH UNDERS

PROBLEM - EXPERIMENTAL VERSIONS ARE EXPENSIVE AND DIFFICULT TO MANUFACTURE. BECAUSE THE MOUNTING OF THE COMMERCIALLY AVAILABLE ELECTRONICS DISPLAY CIRCUITS AND SWITCHES MUST BE DONE BY HAND TO OBTAIN PROPER SUGGESSNESS AND OPERATION OF THE STRUCTURE.

SOLUTION - MAKE THE UNITS A MANUFACTURABLE ITEM SO THAT IT CAN BE MAINT ROULINFLY AVAILABLE FOR INCORPORATION IN AVIONIC SYSTEMS. ESTABLISH THE MANUFACTURING TECHNIQUES TO PROBABLY MOUNT, ALIGN, AND MACHINATE MILITARY DISPLAYS AND SWITCHES.

PRIOR

E1 E2 E3 E4 E5

110 110

110

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MMI FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	TITLE	FUNDING (\$000)	PRIORITY			
			P1	P2	P3	P4
GENERAL		265				
(74.03) TITLE - MULLED WAVEGUIDE PARTS FOR ANTENNAS						
PROBLEM - PHASED ARRAY ANTENNAS ARE TYPICALLY VERY EXPENSIVE AND HEAVY. THEREFORE, MECHANICALLY SCANNED ANTENNAS HAVE BEEN PREFERRED FOR ARMY AIRCRAFT APPLICATIONS. THE ARRAY ANTENNA WAVEGUIDE IS A PRIME CONTRIBUTOR TO WEIGHT AND COST.						
SOLUTION - BY USING INJECTION MOLDING AND METALIZATION OF THE COMPOSITE FORM LESS EXPENSIVE AND LIGHTER WEIGHT WAVEGUIDES CAN BE FABRICATED.			100	650	250	
(74.12) TITLE - INFRARED DETECTOR FOR LASER WARNING RECEIVER						
PROBLEM - SUPPLY OF GALLIUM ARSENIDE ETALONS FOR USE AS IR DETECTORS IS LIMITED. METHODS FOR DIFFUSING THE DEPTOR JUNCTION, FOR SURFACE PASSIVATION, FOR BONDING THE INTERDIGITATED ETALON TO THE INTERDIGITATED DETECTOR ARE LARGELY UNKNOWN.						
SOLUTION - DEVELOP ALTERNATE SOURCES OF GA-AS MATERIAL, AND AUTOMATE METHODS FOR CONTROLLING JUNCTION DIFFUSION, FOR PASSIVATION, AND FOR BONDING LEADS TO THE DETECTOR ARRAY. BUILD SAMPLE DETECTORS.			250	800		
(74.13) TITLE - COMPOSITE ELECTRO-OPTICAL SYSTEM (EOS)						
PROBLEM - MECHANICAL RIGIDITY, STABILITY, OVERALL WEIGHT, AND COSTS ARE PRINCIPLE AREAS AFFECTING THE UTILITY AND AFFORDABILITY OF SOPHISTICATED EOS'S.						
SOLUTION - A COMPOSITE BASED EOS WILL BE FABRICATED UTILIZING THE RESULTS OBTAINED IN THE SLOS PROGRAM.						
COMPONENT	ELECTRO-OPTICAL SYSTEM (EOS)					
(74.14) TITLE - CATEGORY	• CATEGORY					
(74.15) TITLE - DRIVE SYSTEM	• DRIVE SYSTEM					
(74.16) TITLE - BEARINGS	*****					
(75.34) TITLE - ESTABLISH MATCH FOR POWDER FORGE ROLLING BEARINGS						
PROBLEM - LIFE REQUIREMENTS CONDUCTED ON POWDER PROCESSED AISI 4340 STEEL HAVE BEEN OBSERVED WHEN COMPARED TO LAUNCHED CONSUMABLE VACUUM ARC REMELTED (CVR) AISI 4340 STEEL.						
SOLUTION - DEVELOP ECONOMICALLY SOUND PRODUCTION PROCEDURES FOR QUALITY ASSURANCE OF THE POWDER PROCESSING AND SINTERING. AND SUBSEQUENT OPERATIONS TO MANUFACTURE FLAT SHEET COMPONENTS. THE COMPONENTS WILL BE PRESS ED TO NEAR NET SHAPE.						

FIVE WAYS TO
MANAGE
PROJECTS

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PROBLEMS IN MANUFACTURING FROM FEEDS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY AND RESISTANCE TO FAILURE IN PRODUCTION TUYA LINES.

SECTION - CERAMIC TECHNOLOGY TO MANUFACTURE METALLIC AND NON-METALLIC DRIVE PARTS FROM EXISTING OR NEW MATERIALS TO INCREASE RELIABILITY AND LIFE CYCLE COSTS.

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SOLUTION - PROJECT WILL ADDRESS THE TOTAL GEAR MANUFACTURING PROCESS.

REPEAL PROCESSION AND REPEAL

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TITLE: - FASTER METALLURGY GEARS FOR GAS TURBINE COMPONENTS
REPORT: - NEW HIGH TEMPERATURE CLAD MATERIALS NOW PLANNED FOR SERVICE IN HELICOPTER DRIVE TRAINS ARE BECOMING INCREASINGLY DIFFICULT TO PROCESS DUE TO THEIR HIGHER ALLOY CONTENT. AS THE DIFFICULTY INCREASES, SO DOES THE COST.

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SOLUTION - POWDER METAL PLATE NEST SHAPE PROCESSING COUPLED SURFACE PROCESSING REFLECTS THE BEST APPROACH FOR THESE PROJECT WILL ESTABLISH A FULL MANUFACTURING AND QUALITY

PROBLEM - CURRENT PRODUCTION METRICS FOR AIRCRAFT GEARS DO NOT TAKE FULL ADVANTAGE OF THE ADVANCED TECHNOLOGICAL PROCESSES AVAILABLE.

SOLUTION - DEMONSTRATE THE ECONOMY OF USING ADVANCED TECHNOLOGICAL PROCESSES SUCH AS OPTIMAL PRECISION FORGING, LASER OR ELECTRON BEAM HARDENING, ROLL-FORMED GEAR TEETH AND PORTFOLIO COATING IN THE MANUFACTURE OF AIRCRAFT GEARS.

EVALUATION OF HIGH TEMPERATURE CASTING ZINC

PROBLEM - GEAR CARBURIZING IS FREQUENTLY CARRIED OUT WITH A RELATIVELY SLOW
ENGGHTHERMIC PROCESS, TYPICALLY AT 270°C/H, WHICH REQUIRES SURFACE
PROTECTION AGAINST CARBURIZING DURING THE CYCLE IN A POST HEAT TREAT
REMOVAL OF THE DECARBURIZED LAYER.

ELUTION - PERIODIC PROCESSING TIME BY INCREASING THE OPERATING CAPACITY. ALSO INVESTIGATE VACUUM CATERPILLARIZING AND HANDLING OF VARIOUS GEAR CONFIGURATIONS IN OILS IN PRODUCTION A MOVE UNIFORM CARRIER PRACTICE OF STAR TEST.

FUNDING (1860)

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160

200 250 300

415 160

175 75 160 100

MAT FIVE YEAR PLAN
FCS DRAFT 126

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)			
				PRIOR	E1	E2	E3
(CONTINUE)							
GEARS	(77-5) TITLE - AUTO LASER INSPECTION OF SPIRAL BEVEL GEARS	PROBLEM - THE CONTROL OF TOOTH GEOMETRY IN SPIRAL BEVEL GEARS REQUIRES EXTENSIVE MANUAL INSPECTION AND CRITERIA RELATIVE TO MASTER GEARS. THE ACCEPTANCE / REJECTION CRITERIA ARE HIGHLY SUBJECTIVE AND IMPACT THE PRODUCT'S USEFUL LIFE.	SOLUTION - APPLY LASER MEASUREMENT TO THE SURFACE OF SPIRAL BEVEL GEARS. THIS WILL AUTOMATE THE INSPECTION TECHNIQUES AND PROVIDE BETTER QUALITY CONTROL WITH REDUCTION IN INSPECTION TIME.	250			
	(77-6) TITLE - AUTO INSPECT AND PRECISION GRINDING OF SP GEARS	PROBLEM - CURRENT MFG METHOD FOR SPIRAL BEVEL GEARS IS LABOR INTENSIVE REQUIRING CONTACT PATTERN CHECKS WITH EXHAUSTIVE MASTER MATING GEARS. THE PATTERN SHIFTS WITH A CHANGE IN TOOTH AND TEETH NUMBER. AS A RESULT, THE TOOTH FORM EXPERIENCES GREAT STRESS.	SOLUTION - DEVELOP AN AUTOMATED PROD PROCESS OF GRINDING SPIRAL BEVEL GEARS BY TAPE CONTROLLED MACHINES. BASED ON A COORDINATE SYS MADE POSSIBLE BY A PARTIAL NON-INVOLUTE TOOTH FORM.	215	499	215	500
	(77-7) TITLE - DOUBLE HELICAL GEAR	PROBLEM - THE LIFE LIMITING FAILURE MODE OF AIRCRAFT GEARS IS GEAR TOOTH FITTING OR SPALLING. THE DOUBLE HELICAL GEAR PLANETARY SYSTEM WILL UPGRADE PERFORMANCE OF THE TRANSMISSION.	SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS TO PRODUCE THE ONE-PIECE DOUBLE-HELICAL GEAR PLANETARIES BY SHAPING, SHAVING, HARDENING, AND HONING TO REDUCE TRANSMISSION FAILURE RATES.	330	375		
	(77-8) TITLE - COMPUTER CONTROLLED GEAR CROWNING	PROBLEM - PRESENT TECHNOLOGY OF CROWNING CROWNED SPUR GEARS IS BASED ON COMPUTER AIDED USAGE. A PRECISION MICROPROCESSOR CONTROLLED STEPPER MOTOR SYSTEM TO CORRELATE THE MOVEMENT OF WHEEL AND WORK TABLE IS NEEDED FOR INCREASED ACCURACY.	SOLUTION - DEVELOP A MICROPROCESSOR CONTROLLED STEPPER MOTOR SYSTEM TO PERFECT THE GEAR CROWNING TECHNOLOGY.	200			

FIVE-YEAR PLAN
6C: FIRST 1/2

GENERAL

		FUNDING (\$000)				
		PRIOR	E1	E2	E3	E4
(71.4) TITLE - FREQUENT SEIZING CLUTCH MANUFACTURING PROCESS	PROBLEM - WITH THE HIGH OUTPUT SPEED OF TODAY'S DRIVES, THE NEED EXISTS FOR A COST-EFFECTIVE MANUFACTURING PROCESS OF HIGH-SPEED OVERRUNNING CLUTCHES TO BE USED IN HELICOPTER TRANSMISSIONS.	250	250			
SOLUTION - DEVELOP A PROCESS TO PRODUCE HELICAL SPRINGS WITHOUT THE NEED OF START-STOP HOLE WHICH CREATE AN IMBALANCE AND STRESS CONCENTRATION UTILIZING METAL MACHINING PROCESSES.						
SECTION I -- SHAFTS						
(71.5) TITLE - 400 TIP LOADS FOR TRANSMISSION SHAFT SEALS	PROBLEM - CURRENT HELICOPTER TRANSMISSION SEALS ARE SUSCEPTIBLE TO WEAR AND THERMAL DEGRADATION RESULTING IN LEAKAGE OF TRANSMISSION OIL AND FREQUENT SEAL REPLACEMENT.	125	100			
SOLUTION - INTEGRAL WELDING OF A HYSTO ELASTOMERIC SEGMENTED CARBON RING SEAL COPRIMES THE COMPLIANCE OF ELASTOMERIC TIP SEALS WITH THE WEAR RESISTANCE AND TEMPERATURE TOLERANCE OF MECHANICAL CARBON SEALS.						
(71.6) TITLE - 4000 TIP LOADS FOR REPAIR SHAFTS	PROBLEM - DURING OVERHAUL OF HELICOPTER TRANSMISSIONS THE PERCENTAGE OF FAULT REJECTION FOR SPLINE WEAR IS HIGH FOR GEARS WITH SPLINE INTEGRAL SHAFTS.	200	750			
SOLUTION - ESTABLISH THE TOOLING AND INSPECTION PROCEDURES FOR ELECTRON (FAN) TEE WELDING OF COUPLED GEAR SHAFT/SPLIT ELEMENTS. BY THIS METHOD THE MOST EXPENSIVE ELEMENT (THE GEAR) CAN BE SAVED BY A SINGLE LOW COST WELD OF A NEW SPLINE TO THE GEAR/SPLIT.						
SECTION II -- TRANSMISSION HOUSING						
(71.7) TITLE - INTEGRALLY STIFFENED HELICOPTER TRANSMISSION HOUSING	PROBLEM - THE LOW STIFFNESS OF THE CURRENT CH-47 CAST MAGNESIUM ALLOY TRANSMISSION CASE CAUSES EXCESSIVE DEFLECTION DUE TO EXCESSIVE NOISE AND EXCESSIVE VIBRATION.	100	300	650	1000	1100
SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS FOR CASTING INTEGRALLY STIFFENED TRANSMISSION CASES FROM MAGNESIUM CASTINGS.						
(71.8) TITLE - STAINLESS STEEL FRICASSEED HOUSING	PROBLEM - HELICOPTER TRANSMISSION CASES ARE MADE FROM STAINLESS CASTINGS. THEY ARE COSTLY AND HAVE HIGH-TEMPERATURE FATIGUE AT OPERATING TEMPERATURES.	600	1200			
SOLUTION - APPLY VARIOUS FABRICATION TECHNIQUES TO VARIOUS MATERIALS SUCH AS STAINLESS STEEL TO REPLACE A LIQUID, LIGHT, NON-CORROSIVE, AND LESS COSTLY PLASTIC.						

ARMY FIVE YEAR PLAN
KCS DRCMT 126

FIVE YEAR PLAN

KCS DRCMT 126

COMPONENT -- TRANSMISSION HOUSING

(CONTINUED)

(73E4) TITLE - COMPOSITE ENGINE GEARBOX

PROBLEM - CONVENTIONAL GEAR HOUSINGS CONSISTING OF MAGNESIUM EXHIBIT LOW MODULUS, LOW FATIGUE STRENGTH, AND SUSCEPTIBILITY TO CORROSION.

SOLUTION - ESTABLISH A COST EFFECTIVE FILAMENT WINDING MANUFACTURING METHOD FOR A GRAFHTITE FIBER/HIGH TEMPERATURE RESIN COMPOSITE HOUSING.

* C A T E G O R Y *

GENERAL

COMPONENT -- ALL

(73E5) TITLE - CONTROLLED LEAK PRESSURE PROCESS

PROBLEM - LIGHTWEIGHT COMPOSITE STRUCTURES ARE TYPICALLY COMPOSED OF A HOLLOW CORE WITH SCAGDED FIBER REINFORCED SKINS. THE CORE MATERIAL AND ASSOCIATED MACHINING IS COSTLY AND SHOULD BE ELIMINATED.

SOLUTION - THE CONTROLLED LEAK PRESSURE PROCESS PROVIDES A MEANS OF PRODUCING "HOLLOW" STRUCTURES WITHOUT THE USE OF A PRESSURE AGG OR CORE MATERIAL. THE ULTIMATE RESULT IS A LIGHTWEIGHT, HOLLOW CORE, INTEGRALLY STIFFENED STRUCTURE.

COMPONENT -- SAFETY

(73E6) TITLE - PDN OF POLYPHOSPHAZENE FIRE RESIST HYDRAULIC FLUIDS

PROBLEM - CURRENT HYDRAULIC FLUIDS THAT MEET REQUIRE PERFORMANCE SPECIFICATIONS ARE FLAMMABLE.

SOLUTION - THE DEVELOPMENT OF PHOSPHAZENE FLUIDS DEMONSTRATE THERMAL STABILITY, VISCO-ELASTIC PROPERTIES, AND FIRE RESISTANCE. THIS WOULD INCREASE THE FIRE SAFETY OF ARMY AIRCRAFT.

* C A T E G O R Y *

ROTOR SYSTEM

PRIOR

E1

E2

E3

E4

E5

FUNDING (\$1000)

375

250

FUNDING (\$000)

	P104	P1	P2	P3	P4	P5
17.4.1) TITLE - ELECTRIC CLADE BALANCE SYSTEM						
PROBLEM - THE STATIC BALANCING OF NOTCHED BLADES USING CURRENT METHODS RESULTS IN A SIGNIFICANT DIRECT LABOR AND DELAYED TIME EXPENDITURE.						
SOLUTION - LEVEL A COMPUTER ASSISTED CLADE BALANCE MACHINE WHICH DETERMINES THE AMOUNT AND LOCATION OF CORRECTIVE BALANCE DEFICIT ADJUSTMENTS.						
COMMITTEE - CLADE/COMPOSITE STRUCTURES						
17.4.2) TITLE - SET OF OPTIMAL CURE COATS FOR PVC FILTER FIN COMPS	225	175				
PROBLEM - CURRENT METHODS OF CURING COMPOSITES ARE BASED ON EMPIRICAL DETERMINATION OF ANTIQUED PROCESSING CONDITIONS. A TRIAL AND ERROR PROCEDURE IS FOLLOWED UNTIL THE MANUFACTURER IS SATISFACTIONALLY SATISFIED WITH MECHANICAL PROPERTIES.						
SOLUTION - BY LEVELING AND EMPLOYING IMPROVED METHODS OF DETERMINING REQUIRED PRECISION CONDITIONS FOR COMPOSITES, TIME AND PRODUCTIVITY CAN BE IMPROVED IN THIS MOLD.						
17.4.3) TITLE - COMPOSITE TAIL ROTOR BLADE	1807	740	600			
PROBLEM - FILAMENT WINDING FROM A SOLID FLEXEAM TO AN OPEN SPAR SECTION, WINDING TO A NET SHAPE. IMPROVED RESIN CONTROL AND TOLERANCE CONTROL MUST BE OBTAINED TO ENHANCE THE COST EFFECTIVENESS OF FLEXEAM TAIL ROTERS.						
SOLUTION - TECHNIQUES WILL BE DEVELOPED FOR CONTINUOUS FILAMENT WINDING FROM OPEN TO CLOSED SECTIONS, FINDING NET CONTOUR SHAPES. OPTIMIZING TOLERANCE CONTROL WITH IMPROVED TOLARING. AND IMPROVING RESIN CONTROL TO ENSURE MINIMUM WEIGHT REQUIREMENTS.						
17.4.4) TITLE - COMPOSITE MAIN ROTOR BLADE	2970	774	340			
PROBLEM - CURRENT PRODUCTION CONVENTIONAL BLADES HAVE NOT BEEN OPTIMIZED TOWARD OPTIMIZING MANUFACTURING TECHNIQUES, PROCESSSES RELATED TO BLADE CONFIGURATIONS, FAIRING, MACHINING, MIRRORS, AND IMPROVE STRUCTURAL RELIABILITY.						
SOLUTION - IMPROVED WEARABLE MILL INFLATABLE MANIFOLD, INCREASE IR. FILER, AND WEIGHT INCREASED MATERIALS, OPTIMIZE PROTOTYPES, BALANCED SPILL TOLERANCE AND NET WEIGHT WEIGHT.						
17.4.5) TITLE - LOW COST COMPOSITE MAIN ROTOR BLADE FOR THE CH-47A	100	610	2200	2450		
PROBLEM - MANUFACTURING TECHNOLOGY FOR THE CH-47 CLASS AND CH-47A FILAMENT WOUND BLADES ON THE CH-47A ACTIVELY CHALLENGE FOR THE PRODUCTION ENVIRONMENT.						
SOLUTION - DEVELOP AUTOMATED MACHINING PROCESS, FOR MANUFACTURING A SPANNING PROTOTYPING, MIRRORS, AND FILAMENT.						

VENT FIVE: Y1A: FLAN
FCS FACTY 126

FUTURE (S) (1)

FRICK N1 N2 N3 N4 N5

FUTURE (S) (1)

COMPONENT -- BLADE/COMPOSITE STRUCTURES (CONTINUED)

(73e8) TITLE - MANUFACTURING PROOF TESTING OF COMPOSITE ROTOR BLADES

PROBLEM - THERE IS A LACK OF A TECHNIQUE WHICH CAN ACCURATELY DETERMINE STRUCTURAL INTEGRITY OF COMPOSITE MAIN ROTOR BLADES AT THE CONCLUSION OF THE FABRICATION CYCLE.

SOLUTION - ESTABLISH AN ACOUSTIC EMISSION TECHNIQUE FOR PROOF TESTING COMPOSITE ROTOR BLADES.

COMPONENT -- BLADE/LEADING EDGE

(7175) TITLE - AUTO BLADE CONTOUR INSPECTION AIDED INSPECTION

PROBLEM - MEASUREMENT OF THE CONTOUR OF CERTAIN HELICOPTER SURFACES ARE REQUIRED TO BE MADE WITH A HIGH DEGREE OF ACCURACY ON SURFACES WITH WIDTHS UP TO 42 INCHES AND AT A LARGE NUMBER OF POINTS. AVAILABLE SYSTEMS ARE SUSCEPTIBLE TO ERRORS.

SOLUTION - PROVIDE A COMPUTER ABLE, NONCONTACTING OPTICAL GAUGING SYSTEM TO AUTOMATICALLY INSPECT CONTOURS OF SEARS AND AIRFOILS OF HELICOPTER ROTOR BLADES. THIS METHOD WILL INCREASE ACCURACY. REDUCE TIME REQUIRED BY 1/3 AND PROVIDE REPRODUCIBLE INSPECTION.

COMPONENT -- BLADE/SPAR

(73e6) TITLE - EXTRUSION OF PRECISION HOLLOW AIRCRAFT COMPONENTS

PROBLEM - SOME HOLLOW COMPONENTS, SUCH AS TITANIUM BLADE SPARS, ARE MANUFACTURED FROM SHEET BY WELDING A TUBE AND HOT FORMING. THIS IS A VERY EXPENSIVE TECHNIQUE.

SOLUTION - CAD/CAM TECHNIQUES, RECENTLY DEVELOPED FOR EXTRUSION OF SOLID SHAPES, CAN BE APPLIED TO HOLLOW TO IMPROVE EXTRUSION TOLERANCES AND REDUCE MANUFACTURING COSTS.

COMPONENT -- HUB

(7241) TITLE - HOT ISOSTATICALLY PRESSED TITANIUM CASTINGS

PROBLEM - THE CURRENT METHOD OF MANUFACTURING ROTOR HUBS RESULTS IN EXCESSIVE USE OF MATERIALS AND MACHINING. PROJECT FOR FABRICATION OF A COMPOSITE MAIN ROTOR HUB HAS BEEN CANCELLED. THE CURRENT FORGED HUB IS A LONG-LEAD TIME ITEM.

SOLUTION - ESTABLISH THE MANUFACTURING PROCESS FOR HOT ISOSTATIC PRESSING (HIP) OF A CAST BLACKHAWK TITANIUM ROTOR HUB. THE REQUIRED MATERIAL PROPERTIES ARE ATTAINABLE AND A COST SAVINGS OF 36 PERCENT IS EXPECTED.

FMI FIVE YEAR PLAN
RES ORCPT 126

FUNDING (\$000)

	PRIOR	F1	F2	F3	F4	F5
(CONTINUE)						
(714) TITLE - COMPOSITE MAIN ROTOR HUB						
PROBLEM - UNACCEPTABLE SIZE AND WEIGHT PENALTIES ARE INCURRED WHEN CONVENTIONAL METALLIC MATERIALS ARE USED FOR ADVANCED HUB DESIGN.						
SOLUTION - LEVEL OF THE FRICATION TECHNOLOGY, TOOLING AND AUTOMATED TECHNIQUES NECESSARY TO MANUFACTURE COMPOSITE ROTOR HUBS.						
COMPONENTS - MISC. COMPONENTS						
(714) TITLE - MFG TECHNOLOGY FOR ROTOR ITEMS AND ASSOCIATE COMPS						
PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PROCESSUAL BUY ITEMS.						
SOLUTION - DEVELOP TECHNOLOGY TO MFG ROTOR ITEMS AND ASSOCIATED COMPONENTS FROM EXISTING OR NEW MATERIALS THAT WILL INCREASE RELIABILITY AND EXTEND LIFE CYCLE LENGTHS.						
(714) TITLE - NON-DESTRUCTIVE EVAL TECHNIQUES FOR COMPOSITE STRUCTURES						
PROBLEM - IMPLEMENTATION OF COMPOSITE STRUCTURES IN THE ARMY AIRCRAFT IS DEPENDANT UPON THE ABILITY TO EFFECT AND EVALUATE REFFECTS.						
SOLUTION - ESTABLISH A VIABLE AND COMPREHENSIVE IN-PROCESS INSPECTION PROGRAM FOR NON-DESTRUCTIVE INSPECTION OF COMPOSITE STRUCTURES.						
(714) TITLE - IN-PROCESS CONTROL OF RESIN MATRIX CURE						
PROBLEM - CONVENTIONAL CONTROL OF THE CURE STAGE DURING COMPOSITE HARDWARE MANUFACTURING IS ATTAINABLE THROUGH MANUAL OR AUTOMATIC CONTROL OF THE AUTOCLAVE TEMPERATURE AS A FUNCTION OF TIME. THIS METHOD IGNORES THE CHEMICAL STATE OF THE RESIN DURING CURE.						
SOLUTION - USE IN-PROCESS CONTROL TECHNIQUES CAPABLE OF MONITORING THE RESIN FLOW/CURE BEHAVIOR TO INSURE PRODUCTION OF COMPONENTS HAVING CONSISTENTLY HIGH QUALITY.						

* C A T E G O R Y *						
* TURBINFLOW*						

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$1000)				
				PERIOD	K1	K2	K3	K4
(72b) CERAMIC COMPONENTS	LITTLE - CERAMIC TURBINE STATOR PARTS	PROBLEM - EXPENSIVE ALLOYS WITH FRACTIC ELEMENTS ARE CURRENTLY REQUIRED TO EXTEND THE OPERATING TEMPERATURES OF METALLIC ENGINE COMPONENTS TO 2500 F.	SOLUTION - DEVELOP AND DEMONSTRATE THE ECONOMICAL OPERATION OF CERAMIC COMPONENTS FOR HIGH TURBINE TEMPERATURE APPLICATION.	875	1510			
(73c) CERAMIC COMPONENTS	TITLE - CERAMIC COMPONENTS FOR TURBINE ENGINES	PROBLEM - METAL BLADES/VANES FOR TURBINE ENGINES ARE HIGH COST, USE CRITICAL MATERIALS, AND HAVE UNACCEPTABLE TEMPERATURE LIMITATIONS. CERAMIC MATERIALS WHICH HAVE BETTER PROPERTIES ARE NOT USED BECAUSE OF NON-REPRODUCIBLE PROPERTIES AND SHAPE LIMITATIONS.	SOLUTION - SILICON NITRIDE FORNELED BY INJECTION MOLDING AND REACTION LONDING IS SUITABLE FOR VANES, AND SILICON CARBIDE FORMED BY INJECTION MOLDING AND PRESSURELESS SINTERING HAS TEMPERATURE AND PRESSURE CHARACTERISTICS SUITABLE FOR BLADES.	1500	2420	1210		
(74d) COMBUSTOR	TITLE - ZIRCONIA SHROUD PRODUCTION SCALE-UP	PROBLEM - THE ABILITY TO PRODUCE INTEGRATED PERFORMANCE ZIRCONIA TURBINE SHROUDS IN A PRODUCTION ENVIRONMENT HAS NOT BEEN DEMONSTRATED.	SOLUTION - THIS PROJECT WILL DEVELOP A SCALING-UP AND REPRODUCIBLE MANUFACTURING PROCESS FOR THERMALLY SPRAYED ZIRCONIUM OXIDE.	300	210	150		
(75e) COMBUSTOR	TITLE - LOW COST TRANSFERRATION COOLED COMBUSTOR LINER	PROBLEM - COMBUSTOR LINERS OF ADVANCED GAS TURBINE ENGINES ARE REQUIRED TO SURVIVE USING LESS COOLING AIRFLOW THAN HERETOFORE AVAILABLE. STATE-OF-THE-ART TRANSFERRATION COOLED LINERS CAN MEET THE REQUIREMENTS BUT MANUFACTURING PROCESSES ARE NOT COST-EFFECTIVE.	SOLUTION - REFINING A LOW-COST MANUFACTURING TECHNIQUE TO FORM THE NECESSARY COMPLEX SHAPES AND COOLING PASSAGES. PROCESS WILL BE USABLE WITH COMMON COMBUSTOR LINER ALLOYS TO BE CONSISTENT WITH THE LOW-COST CONCEPT BEING PURSUED. JOINING WILL ALSO BE REFINED.	50	300	300		
(77f) TURBINE	TITLE - SEFFER STATIC STRUCTURE FOR TURBINE ENGINES	PROBLEM - TITANIUM STATIC COMPONENTS OF TURBINE ENGINES USE FORGINGS OR CASTINGS, WHICH TO SHEET STOCK AND MACHINED ALL OVER. THIS PROCESS IS TOO COSTLY AND HAS POOR UTILIZATION OF CRITICAL MATERIAL.	SOLUTION - APPLY THE SEFFER TECHNOLOGY TO THE MANUFACTURE OF A TITANIUM STATIC COMPONENT OF A TURBINE ENGINE.	400	470			

501 FIVE YEAR PLAN
AC, RESEARCH

Fabrication (Cont'd)

CONVENTIONAL - COMPRESSOR PLATE

(715-6) TITLE - ISOTHERMAL ROLL FORGING OF COMPRESSOR PLATES

PROBLEM - TECHNOLOGY FOR FABRICATING ADVANCED ENGINE MATERIALS INTO COMPRESSOR PLATE CONFIGURATIONS IS EITHER UNAVAILABLE OR EXCESSIVE IN COST.

SOLUTION - ISOTHERMAL ROLL FORGING IS A UNIQUE FABRICATION PROCESS CAPABLE OF PRODUCING SPARES FREE FROM SURFACE CONTAMINATION WITH SURFACE FINISHES EQUAL TO COOL FORGING AT REDUCED COSTS.

(715-7) TITLE - SPRAY APPLICABLE GAS PATH SEAL SYSTEM

493 145

PROBLEM - METALLIC SYSTEMS CURRENTLY USED IN HIGH PRESSURE TURBINE SEALS GENERATE DUE TO EROSION, CORROSION, AND ADVERSE SUBSTRATE WEAR RESULTING IN INCREASED CLEARANCES OVER THE TURBINE BLADE TIPS AND LOSS OF ENGINE PERFORMANCE.

SOLUTION - EXTENSIVE R&D WORK HAS BEEN PERFORMED UNDER NASA, ARMY, + NAVY CONTRACTS, AND IS BEING USED TO DEVELOP VARIOUS CERAMIC SEAL MATERIAL SYSTEMS. MANUFACTURING PROCESS PARAMETERS WILL BE ESTABLISHED FOR PLASMA-SPRAYED CIPONIUM OXIDE SEAL COMPONENTS.

(715-8) TITLE - CAST TITANIUM IMPELLER FOR TURBINE ENGINE

500 145

PROBLEM - CURRENT CENTRIFUGAL COMPRESSOR IMPELLERS ARE FABRICATED BY MACHINING. THE BLADE PATH AND BLADE SURFACES ARE PREPARED BY MACHINING. THIS RESULTS IN A SUBSTANTIAL LOSS OF MATERIAL AND EXPENSIVE MACHINING OPERATIONS.

SOLUTION - ESTABLISH THE FABRICATION OF TITANIUM COMPRESSOR IMPELLERS BY CASTING, AND HOT-ISOSTATIC PRESSURE (H.I.P.). THIS METHOD WILL OFFICE MANUFACTURING COSTS BY 40% PRESENTLY. IT IS CONSIDERED BY GARTHOR, LTD, ENGLAND, AS A DEMONSTRATED FEASIBILITY.

(715-9) TITLE - TITANIUM POWDER METAL COMPRESSOR IMPELLER

505 140

PROBLEM - WITH CURRENTLY CONFIGURED TURBINE COMPRESSOR IMPELLERS, THE COMPRESSOR STAGES ARE UTILIZED IN CAR, TRUCK, AIRCRAFT, INDUSTRIAL, AND MARINE MANUFACTURING COST ARE ENCOURAGING.

SOLUTION - DEVELOP SMALL PROTOTYPING CAPABILITIES AND EQUIPMENT FOR TITANIUM POWDER METAL WITH TENSILE + ABRASION STRENGTH EQUAL TO THAT OF HIGH QUALITY TITANIUM FORGINGS.

(715-10) TITLE - REVERSIBLE SPRAGGE TURBINE COMPRESSOR PLATE

510 140

PROBLEM - MULTIPLE COMPRESSOR PLATES AND TURBINE PLATES ARE CURRENTLY USED IN THE TURBINE STAGE OF THE TURBINE. THESE PLATES ARE EXPENSIVE, AND ARE NOT REVERSIBLE.

SOLUTION - USE OF REVERSIBLE SPRAGGE TO REPLACE MULTIPLE PLATES IN THE TURBINE STAGE. WHICH FURTHER REDUCES WEIGHT, MAINTENANCE COSTS, AND COST OF APPLICATION. THE SPRAGGE PLATE IS CONSIDERED TO HAVE THE BEST POSSIBLE APPLICATION.

MMT FIVE YEAR PLAN
RCS CIRCUT 126

COMPONENT -- GENERAL

(722) TITLE - MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE EXISTING OR ANTICIPATED HI-PERFORMANCE ENGINE AND ASSOCIATE COMPONENTS USING CURRENT OR NEW MATERIALS.

(723) TITLE - COMPOSITE ENGINE PARTICLE SEPARATOR

PROBLEM - CURRENTLY, FABRICATION OF THE 1700 INLET PARTICLE SEPARATOR (IPS) INVOLVES MACHINING OF CASTINGS AND FORGINGS AND THE JOINING OF THESE PARTS BY WELDING AND BRAZING. THIS IS COSTLY IN TERMS OF BOTH MATERIAL AND LABOR.

SOLUTION - ESTABLISH A NEW PROCESS TO FABRICATE THE IPS FROM INJECTION MOLDED THERMOPLASTIC COMPOSITE, COMBINED WITH HIGH MODULUS, HIGH STRENGTH THERMOSETTING COMPOSITE (GRAPHITE-FOLYIMIDE). THIS WILL PROVIDE WEIGHT AND MONETARY SAVINGS.

(724) TITLE - CLOSED LOOP MACHINING, MID-FRAME

PROBLEM - THE ENGINE MID-FRAME HAS .22 DIAMETERS WITH TOLERANCES RANGING FROM .051 IN. THESE TOLERANCES RESULT IN HIGH MACHINING, REWORK AND INSPECTION COSTS.

SOLUTION - DEVELOP CLOSED LOOP MACHINING THAT WILL AUTOMATICALLY COMPENSATE FOR ANY DEVIATION IN NUMERICAL (CONTROLLED PROGRAMMED) PLAN THEREBY REDUCING PRODUCTION COSTS.

(811) TITLE - MMT-DIAGNOSTIC REVIEW OF MFG CURRENT MFG OPERATION

PROBLEM - BOTH OLD MANAGEMENT AND THE ARMY HAVE EXPRESSED CONCERN REGARDING THE CURRENT STATE OF MANUFACTURING CAPABILITY AND HAVE RECOGNIZED THE NEED FOR UPGRADING THE STAFF TO AN UP-TO-DATE LEVEL OF MFG TECH.

SOLUTION - A GROUP TECHNOLOGY EFFORT TO DEVELOP A COURSE OF ACTION FOR OBTAINING AN OPTIMUM MANUFACTURING OPERATION FOR TURBINE ENGINES.

(812) TITLE - TURBINE ENGINE PRODUCTIVITY IMPROVEMENT

PROBLEM - THE STRATFORD ARMY ENGINE PLANT (SAEP) IS IN NEED OF MODERNIZATION. BOTH THE PLANT AND NEARLY 50 PERCENT OF THE EQUIPMENT IS OVER 25 YEARS OLD. A COMBINATION OF AGING MFG FACILITIES, METHODS, PROCESSES, ETC., HAVE RESULTED IN EXCESSIVE MFG COSTS.

SOLUTION - THE THRUST OF THIS PROJECT IS TO ANALYZE THE ENTIRE SAEP FACILITY WITH A FOCUS ON PRODUCTIVITY, COST SAVINGS AND PLANT MODERNIZATION. AREAS TO BE EVALUATED INCLUDE BOTH MGT AND BUSINESS SYSTEMS EG. MFG METHODS, PROCESSES, EQUIP. FACILITIES, AND CAM.

COMPONENT	TITLE	FUNDING (\$000)	PRIORITY				
			P1	P2	P3	P4	P5
(722)	TITLE - MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS	2000					
(723)	TITLE - COMPOSITE ENGINE PARTICLE SEPARATOR	501	350				
(724)	TITLE - CLOSED LOOP MACHINING, MID-FRAME	540	420				
(811)	TITLE - MMT-DIAGNOSTIC REVIEW OF MFG CURRENT MFG OPERATION	600	550				
(812)	TITLE - TURBINE ENGINE PRODUCTIVITY IMPROVEMENT	100					

MINT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT		FUNDING (\$000)			
		PP10R	\$1	\$2	\$3
-- SEALS					64

(7411) TITLE - SMALL ENGINE TURBINE SEAL OPTIMIZATION

PROBLEM - EFFICIENCIES OF SMALL GAS TURBINES ARE EXTREMELY SENSITIVE TO OPERATING CLEARANCES BETWEEN COMPRESSOR AND BLADE TIPS AND THE STATIONARY SEAL COMPONENTS.

SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZING A DUAL DENSITY PLASMA-SPRAYED CERAMIC SEAL. THE CHEMISTRY OF THE COATING WILL BE OPTIMIZED ALONG WITH THE PROCESS MANUFACTURING PROCESS.

COMPONENT -- TURBINE BLADES

(7511) TITLE - COATINGS FOR UPGRADING F101, CF6 GAS TURBINE ALLOYS

PROBLEM - THERMAL EXPANSION COEFFICIENT MISMATCH BETWEEN THE BOND AND CERAMIC LAYER RESULTS IN THERMAL STRESS CRACKING WITH SUBSEQUENT SPALLING WITHIN THE CERAMIC OVERLAY. R&D BY PRIVATE INDUSTRY HAS SHOWN THE FEASIBILITY OF THERMAL RATCHET CERAMIC OVERLAYS.

SOLUTION - ESTABLISH MANUFACTURING TECHNOLOGY FOR PRODUCING IMPROVED COATINGS ON NICKEL BASED SUPERALLOYS. PLASMA SPRAYED TECHNIQUES WILL BE UTILIZED TO OPTIMIZE A NI-CR-MO CERAMIC THERMAL RATCHET OVERLAY BY ADDING AN INTERMEDIATE LAYER ON THE BLADES.

(7511) TITLE - INTEGRATED BLADE INSPECTION SYSTEM (IBIS)

PROBLEM - INSPECTION OF TURBINE ENGINE BLADES AND VANES NECESSITATES HIGH ACCURACY. THE EFFORT IS TIME CONSUMING AND SUSCEPTIBLE TO ERROR.

SOLUTION - THIS PROJECT WILL IMPROVE THE INFRARED X-PATY AND INFRARED THERMOGRAPHY INSPECTION MODULES BY INCREASING FLEXIBILITY, REPEATABILITY AND SENSITIVITY. ALSO, INSPECTION COSTS WILL BE REDUCED.

(7611) TITLE - ADVANCED TURBINE AIRFOIL CASTING

PROBLEM - TURBINE AIRFOILS ARE DESIGNED TO A STRESS RUPTURE LIMIT WHETHER COOLED OR UNCOOLED. THIS LIMIT IS LOW DUE TO EXHAUST CAST SUPERALLOY MATERIALS CURRENTLY USED AND THEIR INHERENT TURBULENCE LIMITATIONS.

SOLUTION - ADVANCED CASTING TECHNIQUES PERMITTING DIRECTIONALLY-ALIGNED GRAIN GROWTH ELIMINATE THE GRAIN BOUNDARIES UNFAMILIAR TO THE STRESSED DISECTION WHICH INCREASES THE LONGITUDE STRENGTH, CRISP RESISTANCE, AND RUPURE LIMITS.

(7711) TITLE - IMPROV. CUTTING CUTTER - TOUGH COM, ULTRA-HARD CUTTING OPT

PROBLEM - MILLING CUTTER COST ASSOCIATE WITH THE BLISK AND IMPACT FOR THE TOOL. TARGET: 1. AV: PLASTIC 2.5% OF CFRP CUTTER WHICH IS CONSIDERED EXPENSIVELY HI-EXP.

SOLUTION - INVESTIGATE CUTTER BACKING WHICH AFFECT CUTTING LIFE WHICH AS FOLLOWS: CUTTING GEOMETRY AND CUTTING LIQUID AND THICKNESS VELCRO A DIFFERENTLY. TECHNICALLY, THE CUTTER COST IS REDUCED BY 50 percent.

MNT FIVE YEAR PLAN
RCS CRKT 126



COMPONENT -- TURBINE DISKS

(731) TITLE - COMPUTER AIDED HIP OF ENGINE DISKS

PROBLEM - MOST ENGINE DISKS ARE PRODUCED FROM TITANIUM AND SUPERALLOYS BY FORGING AND MACHINING AT CONSIDERABLE COST. HOT ISOSTATIC PRESSING (HIP) IS AN APPLICABLE NEAR NET SHAPE PROCESS BUT IT REQUIRES EXPENSIVE TRAIL AND ERROR RUNS FOR THE PREFORMS.

SOLUTION - A COMPUTER-AIDED DESIGN TECHNIQUE WILL BE DEVELOPED FOR ACCURATE DESIGN OF HIP PREFORMS. THIS TECHNIQUE WILL SIMULATE THE SIMULTANEOUS DENSIFICATION AND HEAT TRANSFER DURING A HIP CYCLE. RECENT WORK HAS SHOWN THE FEASIBILITY OF THIS APPROACH.

(7417) TITLE - LOW COST DISKS BY CAP

PROBLEM - POWDER METAL DISKS FORM A SIGNIFICANT PART OF THE ENGINE COST DUE TO EXPENSIVE TOOLING/DIE REQUIREMENTS AND HIGH PRESSURE CONSOLIDATION EXPENSE.

SOLUTION - RECENT DEVELOPMENTS IN CONSOLIDATION BY ATMOSPHERIC PRESSURE HAS SHOWN THAT SUPERALLOY POWDERS CAN BE CONSOLIDATED TO 98 PERCENT DENSITY AT A REDUCED COST. LOWER COST GLASS LIES CAN ALSO BE USED WHICH REDUCES THE COST FURTHER.

COMPONENT -- TURBINE ROTORS

(7191) TITLE - COST EFFECTIVE PRODUCTION OF COOLED TURBINE ROTORS

PROBLEM - PRODUCTION PROCESSES AND QUALITY CONTROL PROCEDURES DO NOT CURRENTLY EXIST FOR AIR-COOLED TURBINE ROTORS.

SOLUTION - DEVELOP A COST EFFECTIVE PROCEDURE FOR PRODUCING AND ASSURING THE QUALITY OF SINGLE AIR-COOLED ROTORS WHICH CAN DO THE WORK OF TWO STAGES UNDER PRESENT TECHNOLOGY.

(7197) TITLE - FABRICATION OF INTEGRAL ROTORS BY JOINING

PROBLEM - CURRENT GAS TURBINE ROTORS ARE EITHER INTEGSELLY CAST OR THE BLADES AND DISKS ARE SEPARATE UNITS. THE PLISK CONCEPT DOES NOT PERMIT OPTIMUM MECHANICAL PROPERTIES OF THE UNIT AND THE OTHER METHOD REQUIRES COMPLEX AND EXPENSIVE MACHINING.

SOLUTION - A BONDED BLADE AND DISK IS FEASIBLE AND WILL REDUCE THE MAJOR MACHINING REQUIREMENTS, STRESS CONCENTRATIONS, AND SIZE AND WEIGHT CONSTRAINTS ON THE DESIGN. THIS ALSO ALLOWS MATERIAL SELECTION TO BE BASED ON PERFORMANCE RATHER THAN JOINING CAPACITY.

HPI FIVE YEAR PLAN
RCS DRC/T 126

FUNDING (\$000)

COMPARTMENT	TITLE	PRIOR	A1	82	83	84	85
(CONTINUOUS)							
(73.1) TITLE - IMPROVED LOW CYCLE FATIGUE CAST ROTORS	PROBLEM - INTEGRALLY CAST TURBINE ENGINE ROTORS HAVE BEEN SHOWN TO BE COST EFFECTIVE. HOWEVER, INVESTMENT CASTING RESULTS IN LARGE GRAIN SIZES IN THE DISK REGION AND THIS REDUCES FATIGUE LIFE COMPARED TO WROUGHT MATERIAL.	€0	500	300			
SOLUTION - DEFINE CASTING AND HEAT TREAT PARAMETERS, AND FINALIZE THE MANUFACTURING TECHNOLOGY FOR ESTABLISHING FINER-GRAINED CAST ROTOR PRODUCTION UTILIZING GRAIN-REFinement TECHNIQUES.							
(73.1) TITLE - COMPOSITE SHAFTING FOR TURBINE ENGINES	PROBLEM - CURRENT MATERIAL CAPABILITIES ASSOCIATED WITH HIGH SPEED GAS TURBINE ENGINE SHAFTING REQUIRE EXCESS BEARINGS AND CAREFUL DESIGN REGARDING SHAFT DYNAMICS.	300	325				
SOLUTION - RECENT DEVELOPMENTS IN FABRICATING METAL MATRIX COMPOSITE SHAFTING OFFER INCREASED STIFFNESS AND CRITICAL SPEEDS BY 30-40 PERCENT AND CAN REFUSE THE DIAMETER.							
(74.1) TITLE - CAST IMPELLERS AND CLEAN CASTING	PROBLEM - INVESTMENT CAST METAL HAS NUMEROUS SOURCEES OF NON-METALLIC CONTAMINATION DURING CONVENTIONAL PROCESSING. THE RESULTING INCLUSIONS REDUCE CASTING PROPERTIES OR INCREASE CASTING COST BY REQUIRING WELD REPAIR.	685	525	450			
SOLUTION - THIS PROJECT WILL SEEK TO IDENTIFY AND ELIMINATE THE MAJOR CAUSES OF NON-METALLIC INCLUSIONS IN CASTINGS. THE FINDINGS WILL BE APPLIED TO THE CASTING OF HIGH STRENGTH INCO 718 IMPELLERS AND OTHER CRITICAL COMPONENTS							
(74.1) TITLE - CAST INTEGRAL LOW PRESSURE TIPRIMED ROTOR	PROBLEM - THE CURRENT PRACTICE FOR MFG TIP TURBINES IS TO ATTACH CAST TURBINE PLATES TO A FORGED DISK. EXTENSIVE MACHINING OF THE AIRFOIL AND DISK COVE-TAIL JOINTS IS REGU.	650	1120				
SOLUTION - DEVELOP THE PROCESS FOR INTEGRALLY CAST BLisks AND PERFORM ENDURANCE TESTING.							
(74.1) TITLE - IMPROVED CAST TURBINE ROTOR	PROBLEM - DIFFICULTIES HAVE BEEN ENCOUNTERED IN CASTING IN 718 FOR POWER TURBINE ROTORS AS THE ROTORS ARE SHACKLED AND CONTAIN RELATIVELY LONG SLINGER ARMENDS ATTACHED TO LEVER HIPS DESPITE THE UTILIZATION OF HIP TECHNOLOGIES.						330
SOLUTION - SELECTED ALLOYS AND PROCESS WILL BE EVALUATED IN A FULL SCALE ROTOR CONFIGURATION, TESTING IN 718 AS A PRESTLINE.							

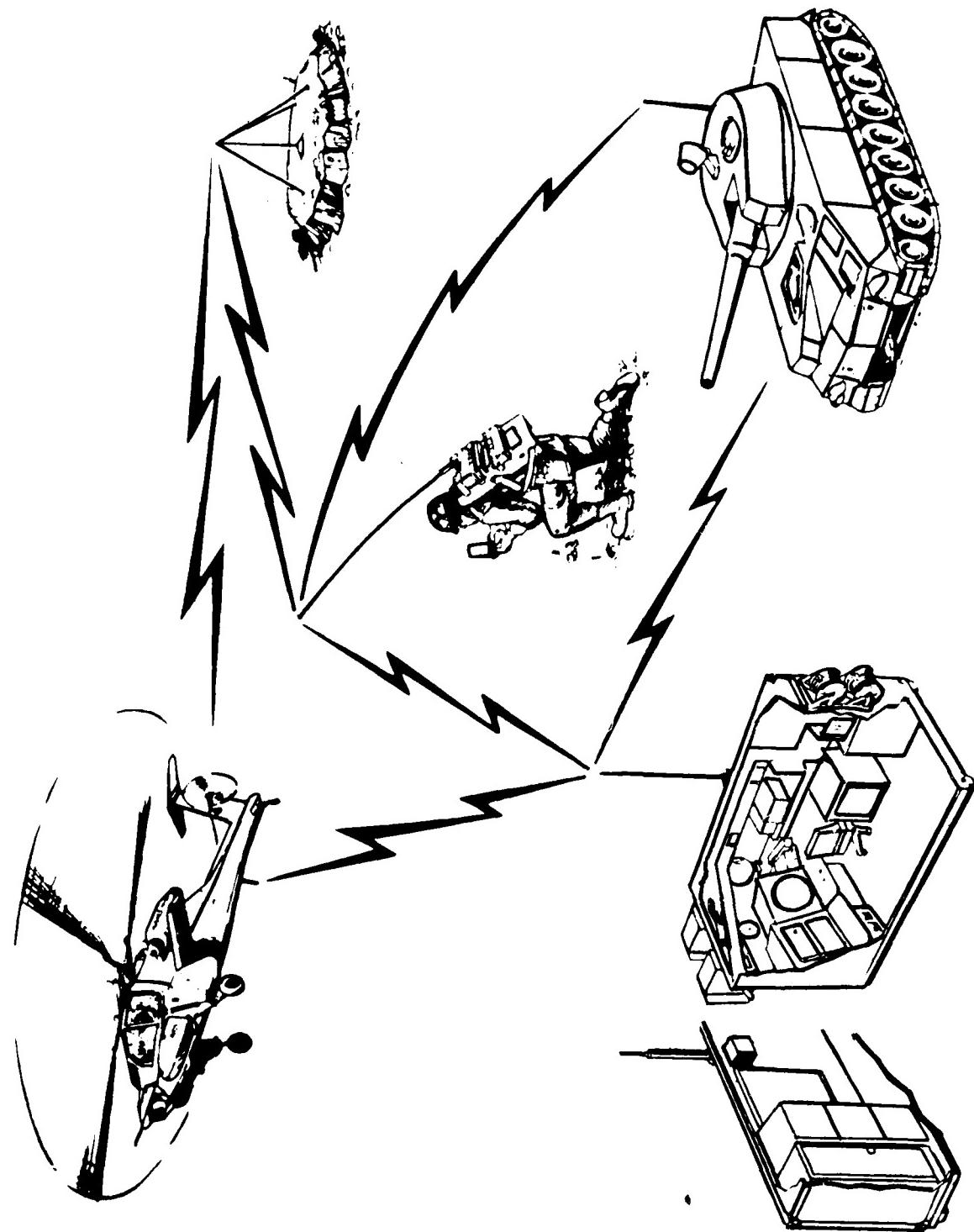
MWT FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$000)

COMPONENT	TURBINE KUTCS	(CONTINUE)	PRIOR	81	82	83	84	85
(7411) TURBINE - SECOND GENERATION DUAL PRECIPITY TURBINE ROTORS								
PROBLEM - SECOND GENERATION TURBINE DESIGNS COULD BECOME SIGNIFICANTLY MORE ATTRACTIVE IN COST AND PERFORMANCE BY IMPLEMENTATION OF ADVANCED MATERIALS AND DESIGN CONCEPTS.				336	350	350	400	

SOLUTION - FABRICATE SECOND GENERATION DISKS BY THE LOWER COST CAP CONSOLIDATION BY ATMOSPHERIC PRESSURE TECHNOQUE. MANUFACTURE TURBINES BY CASTING THEM AS AN INTEGRAL COMPONENT.

COMMUNICATIONS & ELECTRONICS COMMAND (CECOM)



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US ARMY COMMUNICATIONS AND ELECTRONICS COMMAND
(CECOM)

The US Army Communications and Electronics Command (CECOM), headquartered at Ft. Monmouth, NJ, is responsible for research, development, production, and fielding of communications, tactical data, and command and control systems for the Army. CECOM consists of laboratory and technical support segments and Project Managers of Multi-Service Communications System (MSCS), Army Tactical Communications System (ATACS), and project managed elements of Army Tactical Data Systems (ARTADS), i.e., Tactical Fire Control System (TACFIRE), Missile Minder (AN/TSQ-37), Tactical Operations System (TOS), and Position Location Reporting System (PLRS).

CECOM's planned projects cover a variety of electronics problems with special emphasis on computer applications and circuit technology. Projects support efficient manufacturing of custom components for use in future tactical radios.

Video disc information storage is a possible technology for an electronic system for the dissemination of training, technical, and doctrinal data. A project will investigate methods to reduce the cost of mastering and duplicating the discs.

Several projects will obtain the necessary manufacturing technology for the precision crystals and temperature compensated resonators needed to meet the frequency stability requirements of Army tactical radios.

Program funding in the out-years largely anticipates micro-electronics as the driving force in componentry and built-in test capability for command, control, and communications systems. Computer-dominated methodologies are inherent in such areas as design, manufacture, and manufacturing documentation for communications systems and are expected to be of particular value for the short lead time, low volume production anticipated for future equipment and systems.

CECOM
COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
DETECTORS	670	0	612	0	0
DISPLAYS	777	950	0	0	0
FREQUENCY CONTROL	1629	827	1200	425	0
GENERAL	125	120	3000	1900	1000
INTEGRATED ELECTRONICS	680	495	1000	2400	0
OPTICS	0	0	0	225	0
SOLID STATE	0	500	0	0	0
TOTAL	4281	2692	5812	4950	1000

* C A T E G O R Y *

*DETECTORS *

MMI FIVE YEAR PLAN
RCS DRCP 126

COMPONENT -- PHOTO/OPTICAL

(3050) TITLE - III-V SEMICONDUCTOR PHOTODETECTORS

PROBLEM - INTRINSIC AND INDUCED LOSSES LIMIT RANGE OF FIBER OPTIC TRANSMISSION. PRODUCTION MEANS WILL BE NEEDED FOR PHOTODETECTOR CAPABLE OF OPERATION IN SPECTRAL REGION INTRINSICALLY LESS SUSCEPTIBLE TO SUCH LOSSES.

SOLUTION - THIS PROJECT WILL ESTABLISH PRODUCTION TECHNIQUES FOR FORMATION OF A QUATERNARY III-V SEMICONDUCTOR PHOTODIODE WITH GUARD RING, SEMIAUTOMATIC ATTACHMENT AND MOUNTING AND AUTOMATIC TESTING OF THE ASSEMBLY.

* C A T E G O R Y *

*DISPLAYS *

COMPONENT -- MISCELLANEOUS

(3056) TITLE - ELECTROLUMINESCENT NUMERIC MODULE

PROBLEM - HIGH CONTRAST NUMERIC READOUTS ARE REQUIRED FOR SUNLIGHT LEGIBILITY AND FULL ENVIRONMENTAL OPERATION IN TACTICAL EQUIP. ELECTROLUMINESCENT MODULES NEEDED TO FULFILL THIS REQUIREMENT ARE AVAILABLE ONLY AS SMALL QTY, HIGH COST, LAB BUILT SAMPLES.

SOLUTION - THIN FILM CIRCUITRY TECHNIQUES AND HYBRID ASSEMBLY PROCEDURES WILL BE USED TO ACHIEVE AN EFFICIENT HIGH YIELD MFG TECHNOLOGY CAPABLE OF PRODUCING RELIABLE FULLY MILITARIZED NUMERIC DISPLAY DEVICES AT REASONABLE COST FOR LARGE VOLUME USAGE.

(3073) TITLE - TACTICAL GRAPHICS DISPLAY PANEL

PROBLEM - FAB OF ELECTROLUMINESCENT DISPLAY PANELS REQUIRES REPRODUCIBLE DISPOSITIONS OF ELECTROLUMINESCENT PHOSPOR DIELECTRIC LAYER AND TRANSPARENT CONDUCTORS. INTERCONNECTION OF INTEGRATED DRIVER AND SHIFT REGISTER CIRCUITS IS NECESSARY.

SOLUTION - UNIFORM REPEATABLE THIN FILM DEPOSITIONS WILL BE ESTABLISHED OVER SUBSTRATE SIZES UP TO 12 INCH DIAGONAL MEASURE. COST WILL BE REDUCED BY OPTIMUM CLEANING, HANDLING, AND PRODUCTION SEALING TECHNIQUES.

* C A T E G O R Y *

*FREQUENCY CONTROL *

FUNDING (\$000's)

PRIOR	P1	P2	P3	P4	P5
	612				

MMT FIVE YEAR PLAN
RCS ORCIT 126

	FUNDING (\$000)				
	PRIOR	b1	b2	b3	b4
CONVENTIONAL CRYSTALS	600				

CONVENTIONAL CRYSTALS

(S347) TITLE - LOW COST HIGH STABILITY QUARTZ RESONATORS

PROBLEM - SINCGARS FREQUENCY STABILITY REQUIREMENTS CANNOT BE MET WITH PRESENTLY AVAILABLE MASS PRODUCTION CRYSTALS. HAND PICKED, LOW YIELD CRYSTALS ARE RELIABLE AND PRODUCTION PROBLEMS WILL ARISE DUE TO A SHORTAGE OF PRECISION CRYSTALS.

SOLUTION - ACHIEVE THE TECHNOLOGY NECESSARY TO PRODUCE LARGE QUANTITIES OF HIGH STABILITY, LOW COST CRYSTALS.

(S347) TITLE - HIGH STABILITY VIBRATION RESISTANT QUARTZ CRYSTALS

PROBLEM - CURRENT CRYSTAL RESONATORS SHOW FREQUENT CHANGES WITH ACCELERATION. THIS IS A SERIOUS PROBLEM WHERE THE RESONATOR MUST OPERATE IN A VIBRATORY ENVIRONMENT. CONSEQUENCES ARE ESPECIALLY SEVERE WHEN EQUIPMENT MUST OPERATE IN A JAMMING ENVIRONMENT.

SOLUTION - DOUBLE ROTATED QUARTZ CRYSTAL RESONATORS, PARTICULARLY THE SC-CUT, HAVE A MUCH LOWER SENSITIVITY TO MECHANICAL STRESS THAN THE COMMONLY USED (SINGLY ROTATED) AT-CUT. BASED ON R&D AND OTHER INFORMATION PRODUCTION TECHNIQUES WILL BE DEVELOPED.

(S4-1) TITLE - TACTICAL MINIATURE CRYSTAL OSCILLATORS

PROBLEM - STATE-OF-THE-ART PRECISION QUARTZ OSCILLATORS DO NOT MEET THE PERFORMANCE, PRODUCTIBILITY, AND COST CRITERIA SPECIFIED FOR PLANNED EQUIPMENT. TACTICAL MINIATURE CRYSTAL OSCILLATORS (TMCO) IS HIGH PERFORMANCE BUT REQUIRES NEW PRODUCTION TECHNIQUES.

SOLUTION - ESTABLISH QUALITY CONTROL PROCEDURES AND COST EFFECTIVE PROCESSES FOR ASSEMBLY, OUTGASSING, SEALING, AND TESTING PRODUCTION TMCO. ALSO, DESIGN AND FABRICATE SPECIAL MOLDING AND TOOLING FOR IMPLEMENTING MANUFACTURING PROCESSES UNIQUE TO TMCO.

CONVENTIONAL OSCILLATORS

(S347) TITLE - MICROWAVE COMPENSATED CRYSTAL OSCILLATORS

PROBLEM - LOW POWER TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS WITH STABILITY (1-5XICE-7) SUITABLE FOR USE IN JAM PROOF RADIOS (SINCGARS) ARE NOT AVAILABLE IN PRODUCTION QUANTITIES.

SOLUTION - ESTABLISH FRACTURE CAPABILITY FOR COST EFFECTIVE, LONG LIFE, STABLE CRYSTALS, WHICH UTILIZE MICROPHASE FOR TEMPERATURE COMPENSATION FOR CRYSTALS.

877

WWT FIVE YEAR PLAN
KCS DRCT 126

COMPONENT -- OSCILLATORS	(CONTINUED)	FUNDING (\$000)				
		PRIOR	P1	P2	P3	P4
(3043) TITLE - 56-46 AND 54-54 GHZ GUNN OSCILLATOR PRODUCTION PROCESS		600	425			
PROBLEM - TECHNIQUES FOR EFFICIENT MANUFACTURE OF DEVICES TO BE USED IN FUTURE ARMY MULTICHANNEL RADIO SYSTEMS REQUIRE GOVERNMENT INVESTMENT TO ASSURE THEIR AVAILABILITY						
SOLUTION - ACHIEVE SUCH MANUFACTURING TECHNOLOGY THROUGH GOVERNMENT FUNDED MANTech EFFORT						
***** * C A T T C U K Y * *-----* *GENERAL* *****						
COMPONENT -- MISCELLANEOUS		125				
(3045) TITLE - GRAPHICAL PART PROGRAMMING EVALUATION						
PROBLEM - POTENTIAL EXISTS TO EXTEND THE EXISTING COMPUTER-AIDED INTERACTIVE DESIGN SYSTEMS FOR THE CREATION OF NUMERICAL CONTROL TAPES AND THREE-DIMENSIONAL PART GEOMETRIES TO A BROAD RANGE OF DOD EQUIPMENT REQUIREMENTS.						
SOLUTION - THIS PROJECT WILL EVALUATE THE CAPABILITY OF EXISTING COMPUTER-AIDED INTERACTIVE DESIGN SYSTEMS TO PRODUCE NUMERICAL CONTROL PART PROGRAMS AND PART GEOMETRIES FOR DOD PRODUCTION REQUIREMENTS.						
(3041) TITLE - TOCL FOR PRODUCTION OF SFA DOCUMENTATION						
PROBLEM - CONVERSION OF EXISTING MAINTENANCE AND TRAINING DOCUMENTATION TO INTERACTIVE ELECTRONIC DISPLAY FORMAT REQUIRES HIGH DEGREE OF AUTOMATION TO BE PRACTICAL						
SOLUTION - ACHIEVE WORKABLE SOFTWARE, DEFINE AND ACQUIRE HARDWARE						
(3042) TITLE - MASTERING AND DUPLICATION OF VIDEO DISCS			450			
PROBLEM - THE HIGH COST OF MASTERING AND DUPLICATING OF VIDEO DISCS HAS RESTRICTED THE USE OF THE TECHNOLOGY IN HIGH PAYOFF TRAINING AND MAINTENANCE OPERATIONS.						
SOLUTION - THIS PROJECT WILL PROVIDE METHODS AND TECHNIQUES FOR LOW-COST MASTERING AND DUPLICATION OF VIDEO DISCS.						
(3043) TITLE - INTELLIGENT TERMINALS & PERIPHERALS FOR MILITARY COMPUTERS						1700
PROBLEM - THERE IS A NEED TO ESTABLISH A PRODUCTION CAPABILITY TO MANUFACTURE TO FORM, FIT, AND FUNCTION INTELLIGENT TERMINALS AND PERIPHERALS FOR THE MILITARY COMPUTER FAMILY.						
SOLUTION - OBTAINING THIS CAPABILITY WILL PERMIT THE FABRICATION OF COST-EFFECTIVE TERMINALS AND PERIPHERALS WITH IMPROVED FLEXIBILITY, INTEROPERABILITY, SURVIVABILITY AND REDUCED ACQUISITION TIME.						

M&T FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(3049) TITLE - FUNCTIONAL SEGMENTATION OF AUTO TEST EQUIP

PROBLEM - ARMY ELECTRONIC ITEMS MUST BE TESTED ON EXPENSIVE AUTOMATIC TESTERS THAT CONTAIN MORE CAPABILITY THAN NEEDED AND COST MORE THAN MOST FIRMS CAN AFFORD.

SOLUTION - RECONFIGURE THE AN/USM-41 EQUIP TESTER TO PERMIT A MINIMUM OF MODULES TO DO SOME LOW ORDER TESTING AND PERMIT ADD-ONS TO BE ADDED TO UPGRADE THE GEAR TO HANDLE ADDITIONAL TESTS AS NEEDED. WORK ON SOFTWARE COMPATIBILITY.

(3076) TITLE - ANALOG CIRCUIT TEST PROGRAM AUTOMATIZED PREPARATION-III

PROBLEM - PRESENT HIGH COST OF TEST PROGRAM PREPARATION

SOLUTION - REFERENCE SUCH COSTS BY EXTENDING PREVIOUS WORK DONE TO ADDITIONAL CIRCUIT TYPES AND SOME COMPOSITE CIRCUITS

(3077) TITLE - EXISTING TEST PROGRAM USAGE ON STANDARD ATF

PROBLEM - PRESENT PROCEDURE FOR ATF SOFTWARE RESULTS IN TEST EQUIPMENT SPECIFIC PROGRAMS

SOLUTION - CREATE AN INTERVAL ROUTINE THAT WILL PERMIT EXISTING TEST PROGRAMS TO BE UTILIZED BY STANDARD ATF SYSTEMS.

* C A T C H O R Y *

INTEGRATED ELECTRONICS

COMPONENT -- AMPLIFIERS

(9815) TITLE - INTEGRATE CONTROL CIRCUIT FOR THIN FILM TRANSISTOR DISPLAY

PROBLEM - SEMICONDUCTOR DISPLAY DEPENDS ON COMPACT YET COMPLEX DRIVE CIRCUITS. A MULTI-STAGE VACUUM RETARLIZING SYSTEM IS NECESSARY.

SOLUTION - DEVELOP MASK MOUNTING AND CHANGING TECHNIQUES. DEVISE METHODS FOR CLEANING AND POSITIONING MASKS WITH CUT CHANGING REGISTRATION. PUT PIRIPHEAL CIRCUITS IN DISPLAY FRAME.

FUNDING (\$000)

PRIOR E1 E2 E3 E4 E5

120 750

450

450

1049 670 445

NET RIVET YAH PLAN
HC₂ CHCT 126

FUNDING (1000)

F10K E1 E2 E3 E4 E5

COMPONENT -- CIRCUITY

(35) TITLE - SPECIAL COMPONENTS WFG TECHNIQUES FOR SINGLE CHANNEL RATIOS

PROBLEM - SILICONIC CONDUCTOR INTEGRATED CIRCUITS DESIGNED FOR SPECIAL COMMUNICATIONS EQUIP. MUST BE CUSTOM DESIGNED FOR EACH NEW APPLICATION. EACH IC REQUIRES SEVERAL MASK SETS AND A NUMBER OF IC APP REQUIRED FOR EACH DEVICE.

SOLUTION - DEVELOP COMPUTER AIDED MANUFACTURING TECHNIQUES THAT WILL REDUCE THE COST OF AND IMPROVE THE RELIABILITY OF SEMICONDUCTOR INTEGRATED CIRCUITS

(36) TITLE - VLSI LSI CHIP SETS FOR MILITARY COMPUTER FAMILY MODULES

PROBLEM - THERE IS A NEED FOR CONTINUING DEVELOPMENT OF INTEGRATED CIRCUIT TECHNOLOGY IN THE AREA OF LSI AND VLSI TO PROVIDE CHIP SETS OF MILITARY COMPUTER FAMILY MODULES AND MODULES TO REDUCE SIZE AND COST OF MCF SYSTEMS.

SOLUTION - THE DEVELOPMENT OF LSI AND VLSI CHIP SETS WILL PERMIT MAJOR REDUCTIONS IN MCF SYSTEM SIZE FROM 5-7 FOXES TODAY DOWN TO ONE FOX IN THE U.S. IT WILL ALSO MEAN SIGNIFICANT REDUCTION IN COSTS AND PROVISION OF COMMON BUS INTERFACING.

* C A T E G O R Y *

* OPTICS *

COMPONENT -- FIBER

(37) TITLE - IMPROVED GLASS PROCESSES FOR OPTICAL FILTERS

PROBLEM - GLASS FIBER IMPURITY CONTENT CONTRIBUTES TO TRANSMISSION LOSS.
FREEFORM PROCESS LIMITS FIBER LENGTH

SOLUTION - ALIGHT TECHNIQUES NOW IN EXPERIMENTAL STAGE WHICH SHOW POTENTIAL FOR SOLVING THE PROBLEMS.

* C A T E G O R Y *

* SOLID STATE *

MMI FIVE YEAR PLAN
HCS DRCP 126

FUNDING (\$000)

PRIOR 61 62 63 64 65

COMPONENT -- DIODES/RECTIFIERS

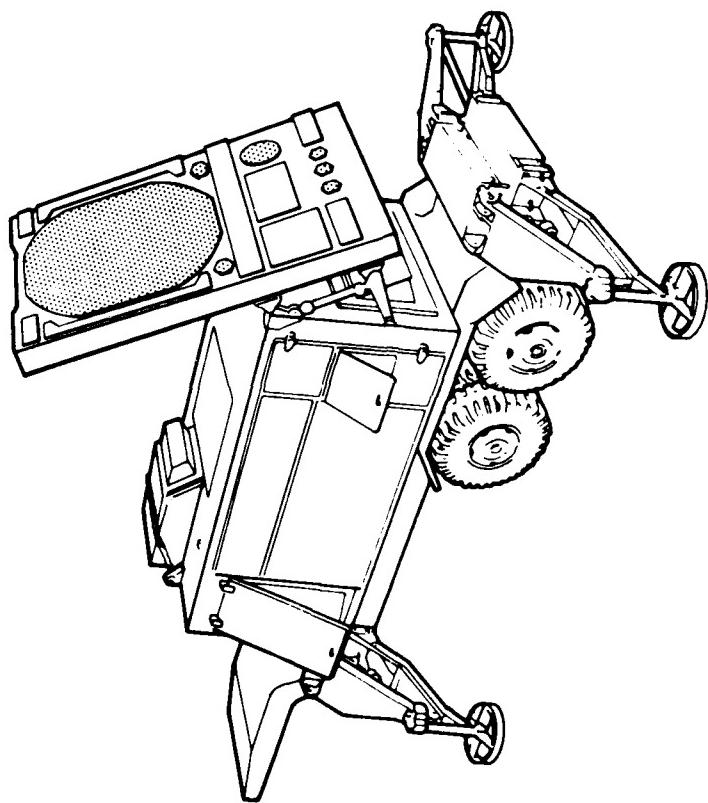
(300) TITLE - INCREASE PROG OF SEMICONDUCTOR CONTROL DIODES

PROBLEM - PRESENTLY AVAILABLE VARACTORS AND PIN DIODES MADE BY SILICON DIODE TECHNOLOGY ARE EXPENSIVE. THE IR PRODUCTION TECHNIQUES ARE VERY LABOR INTENSIVE. YIELDS ARE LOW, AND UNIFORMITY IS POOR. MATCHING REQUIRES EXTENSIVE TESTING.

SOLUTION - USE GALLIUM ARSENIDE FOR THESE DEVICES. USE AUTOMATIC CONTROL SYSTEM FOR PROCESSES. INSTEAD OF MANUAL PROCEDURES TO INCREASE YIELD. DEPOSIT A MEDIUM TEMPERATURE PASSIVATION LAYER ON PIN DIODES TO IMPROVE RELIABILITY AND UNIFORMITY.

500

ELECTRONICS R&D COMMAND
(ERADCOM)



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US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND
(ERADCOM)

ERADCOM is the Army's focal point for electronics research, development and acquisition (RDA) activities, and maintains programs in such areas as electronics signal intelligence, electronic warfare, atmospheric sciences, target acquisitions and combat surveillance, electronic fuzing, radars, sensors, night vision, radar frequency and optical devices, nuclear weapons effects, instrumentation and simulation, and fluidics.

Seven laboratories are integrated into ERADCOM's structure. These laboratories are product oriented and as a result can identify major problem areas where applied MMT efforts can provide important benefits. Although ERADCOM and its laboratories identify and manage projects, the bulk of the actual work is contracted out to industry.

A major area of interest is developing legible tactical displays which are suitable for military use. Because of operational limitations in legibility, power requirements, weight and RAM (reliability, availability and maintainability) characteristics conventional displays are unacceptable. New technologies for rugged flat panel displays which can satisfy these requirements are now in development but need improved manufacturing methods for effective production.

Improving sighting capabilities is an area of prime concern to all the Services. Several projects for significant improvements in production techniques for image intensifiers are included in the Plan. The development of millimeter wave and infrared laser systems for all-weather and smoke fighting is being pursued. This will require the development of new control systems and subsystems. Improved techniques will be needed to insure the quality and quantity of such systems. Projects are also included that deal with thermal optical systems. These include the present generation Common Modules and future second generation systems such as the ATAC and MISTAF FLIRS (Forward Looking Infrared Systems) and the Thermal Weapon Sight (TWS).

C O M M A N D F U N D I N G S U M M A R Y
[RADCOM
(THOUSANDS)]

CATEGORY	FY81	FY82	FY83	FY84	FY85
DETECTORS	1467	6	3200	4350	\$650
DISPLAYS	303	0	800	3100	\$50
ELECTRON TUBES	0	1300	2450	2600	0
FREQUENCY CONTROL	0	0	1000	0	2000
GENERAL	0	1179	1000	1850	0
INTEGRATED ELECTRONICS	663	1179	1650	5600	2750
LASER	523	621	2350	500	1700
OPTICS	596	0	1250	950	1050
PASSIVE COMPONENTS	0	596	0	0	0
POWER SOURCES	0	0	650	0	0
SOLID STATE	1152	2329	1200	0	500
TOTAL	4904	7212	15550	18950	14500

* P A T : C G H Y *

* E T I C T S *

FMT FIVE YEAR PLAN
RCS ORCHT 126

FUNDING (\$000)

PRIOR	81	82	83	84	85
1000	1000	1000	1000	1000	1000

COMPONENT -- ARRAYS

(511.7) TITLE - 4-5 MICRON TIE COOLED FOCAL PLANE MODULES

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 3-5 MICRONS REQUIRE USE OF HIGH DENSITY MATRIX DETECTOR ARRAY IN THE ORDER OF 2000 ELEMENTS. THIS EQUIPMENT CAN'T BE PRODUCED WITH TODAY'S THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE ARRAY COOLER/DEWAR MODULES TO OPERATE AT 195 K. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.

(506.3) TITLE - VACUUM DEWARS FOR MOSAIC ARRAYS FOR 240 GFN. FLIR

PROBLEM - NEW DEWAR CONCEPTS MUST BE ESTABLISHED TO HOUSE THE NEW GENERATION FOCAL PLANE ARRAYS SUCH THAT VACUUM INTEGRITY AND MECHANICAL STABILITY ARE MAINTAINED.

SOLUTION - DEVELOP PRODUCTION TECHNIQUES FOR LOW OUT-GASSING DEWAR COMPONENTS.

(511C) TITLE - COMMON MODULE DETECTOR ARRAY

1300 753

PROBLEM - MERCURY-CADMIUM TELLURIDE DETECTOR ARRAYS ARE NOW HAND LAPPED AND POLISHED. CCI, TACT MASKING IS USED FOR PHOTOLITHOGRAPHY AND WET ETCHING FOR DELINEATION. ALSO, GOLD WIRING IS USED FOR LEADCUTS. THESE ARE LABOR INTENSIVE AND NON-UNIFORM.

SOLUTION - USE SEMICONDUCTOR INDUSTRY PRACTICES (BATCH MACHINE LAPING AND POLISHING OF HG-OD-TE WAFERS, PROJECTION PHOTOMASKING, PLASMA ETCHING, ION BEAM MILLING, LEAD-OUT METALLIZATION, AND PLATING. THESE SHOULD PROVIDE UNIFORM RESULTS.

(512E) TITLE - ROOM TEMPERATURE NMW DETECTOR ARRAYS

650

PROBLEM - EFFICIENT RADIATION COUPLING BETWEEN ANTENNAS AND DETECTORS REQUIRES EXTREME DIMENSIONAL AND INDEX OF REFRACTION TOLERANCES.

SOLUTION - DEVELOP METHODS TO DEPOSIT DIELECTRIC / THIN FILM METAL WAVEGUIDE STRUCTURES WITH PREDICTABLE AND CONTROLABLE EFFECTIVE INDICES OF REFRACTION.

(511) TITLE - LIQUID PHASE EPITAXIAL HCCTE

2000

PROBLEM - LOW YIELD ON CURRENT METHOD OF MANUFACTURE OF COMMON MOLDING DETECTIVE ARRAYS. GROWTH OF HCCF CRYSTALS REQUIRES MANUAL LAPING, POLISHING & THINNING TO AC-TIVE PERFORMANCE SPECIFICATIONS.

SOLUTION - USE LIQUID PHASE EPITAXIAL GROWTH OF THIN-FILM ON COTI SUBSTRATE ELIMINATING MANUAL STEPS.

NET FIVE YEAR PLAN
FCS ERCHT 176

ITEM # - TRANSISTOR

164

(CONT'D) TITLE - MAGNETIC SUSPENSION COUPLER

PROBLEM - SECOND GENERATION FLIR'S WILL EMPLOY MAGNETIC SUSPENSIONS IN THE CRYSGENIC COUPLERS. MAINTAINING CRITICAL SUSPENSION TOLERANCES IN PRODUCTION WILL REQUIRE DEVELOPING EXTENSIVE QUALITY CONTROL PROCEDURES.

SOLUTION - DEVELOP MANUFACTURING METHODS FOR MAINTAINING CRITICAL TOLERANCES.

165) TITLE - ADVANCED MECHANICAL COUPLERS FOR 2nd GEN. FLIR'S

PROBLEM - SECOND GEN. GEN. SENSORS ARE NOW VERY SUSCEPTIBLE TO VIBRATIONS AND THERMAL FLUCTUATIONS. IC A LARGEF DEGREE THAT CONVENTIONAL FIRST GEN. SYSTEMS.

SOLUTION - DEVELOP MANUFACTURING TECHNIQUES FOR PRODUCING THERMAL FLUCTUATIONS AND VIBRATIONS

166) TITLE - 1-2 MICRON CHARGE COUPLER DEVICE

PROBLEM - NEW PROJECT NO. PROBLEM FURNISHED

SOLUTION - NEW PROJECT NO. PROBLEM FURNISHED

167) TITLE - 1MM. SIZE PYROELECTRIC ACER

PROBLEM - LOW YIELD OF PYROELECTRIC MATERIAL SUITABLE FOR RETINA. LOW YIELD OF INTERCONNECT FROM PYROELECTRIC MATERIAL TO THE CCD.

SOLUTION - DEVELOP METHODS FOR THE PRODUCTION OF LARGE AMOUNTS OF PYROELECTRIC MATERIAL. DEVELOP INTERCONNECT TECHNIQUES FOR THE PRODUCTION OF PYROELECTRIC RETINA.

168) TITLE - PYRO-ELECTRIC COOLER MATERIAL

PROBLEM - SUPPLY HIGH PERF. MATERIALS REQUIRED FOR 2 GEN. FLIR TE COOLERS ARE AVAILABLE ONLY IN RESEARCH QUANTITIES & QUALITIES. TRANSITION FROM RESEARCH TO PRODUCTION WILL INVOLVE VARIOUS INTEGRATION FACTORS.

SOLUTION - ESTABLISH PRE-PRODUCTION STAGES & TECHNIQUES FOR HIGH QUALITY COOLING NECESSARY TO MEET SECOND GEN. FLIR DEMANDS.

169) TITLE - TOTAL OPTIMIZATION LOW COST COOLER TUBE

PROBLEM - TRADITIONAL MANUFACTURING METHODS REQUIRE THE USE OF AN EXCESSIVE AMOUNT OF HAND LABOR WHICH CONTRIBUTE TO HIGH UNIT COSTS FOR THE MANUFACTURE OF TUBE.

SOLUTION - DETERMINE THE MOST ECONOMICAL METHOD FOR PRODUCING A LOW COST SRC GENERATION IMAGE INTENSIFIER TUBE. THE METHOD WILL BE PROVEN BY PRODUCING A SAMPLE TUBE LOT.

ITEM # - TRANSISTOR

FUNDING (\$000)

PRIOR 81 82 83 84 85

350

300

350

174

μ92 714

MMI FIVE YEAR PLAN
RCS DRMT 126

COMPONENT	-- LASER	(5066)	TITLE - 1 TO 3 MICRON AVALANCHE DETECTORS	FUNDING (\$000)					
				PRIOR	81	82	83	84	85
									500
			PROBLEM - MANUF. COSTS, VOLUME PROD. TECHNIQUES AND RELIABILITY HAVE TO BE ADDRESSED.						
			SOLUTION - ESTABLISH MANUFACTURABLE CRAFTABILITY FOR VOLUME PRODUCTION OF RELIABLE, LOW COST 1-3 MICRON AVALANCHE DETECTORS.						
COMPONENT	-- PHOTO/OPTICAL	(5067)	TITLE - UNIVERSAL INTEGRATED OPTICS MODULE						700
			PROBLEM - PRESENT INTEGRATED OPTICS DEVICES ARE COMPOSED OF SEPARATE LIGHT SOURCE, PROCESSOR AND DETECTOR. IT IS POSSIBLE TO COMBINE THESE COMPONENTS ON A SINGLE CHIP. FABRICATION METHODS AND RELIABILITY HAVE TO BE IMPROVED.						
			SOLUTION - DEV. FABR. METHODS FOR OPTIMUM INTERFACE OF LIGHT SOURCE AND DETECTOR WITH ACOUSTO-OPTIC DEVICES.						
COMPONENT	-- CRT	(5068)	TITLE - HIGH CONTRAST CATHODE RAY TUBE						303
			PROBLEM - HIGH CONTRAST CRT AVIONIC DISPLAYS FOR DAY-NIGHT NIGHT VISION GOOGLES ARE CURRENTLY UNAVAILABLE. OPTICAL FILTERS ARE ENVIRONMENTALLY LIMITED FOR THIS APPLICATION. PHOSPHOR TECHNIQUES ARE AVAILABLE BUT OPTIMIZATION AND ECONOMICS HAVE NOT BEEN SHOWN.						
			SOLUTION - USE OF OPTIMIZED BI-LAYER TRANSFER-FRT PHOSPHERS WITH A BLACK ABSORBENT LAYER PROVIDES THE HIGH CONTRAST DISPLAY FOR THE SEVERAL MODES. OPTIMIZATION OF PHOSPHOR TECHNIQUES FOR 5 IN AND LARGER CRT'S WILL BE ECONOMICALLY JUSTIFIED.						
(5071)	TITLE - TACTICAL COLOR CATHODE RAY TUBE								800
			PROBLEM - PRESENTATION OF HIGH DENSITY INFORMATION UNDER TACTICAL CONDITIONS REQUIRES CODING THAT CAN BE PROVIDED BY COLOR. AVAILABLE COLOR CRT'S CANNOT SURVIVE TACTICAL CONDITIONS WITHOUT EXPENSIVE AND MARGINALLY EFFECTIVE MODIFICATIONS.						
			SOLUTION - CRT DISPLAYS CAN BE DESIGNED TO OPERATE UNDER THE VIBRATION, TEMPERATURE AND MAGNETIC ENVIRONMENT OF THE TACTICAL BATTLEFIELD IF THE TOTAL SYSTEM IS DESIGNED FOR THESE CONDITIONS. ECONOMICAL FABRICATION PROCESSES FOR SUCH DISPLAYS MUST BE DEVELOPED.						

MMM FIVE YEAR PLAN
RCS DRCPY 126

COMPONENT	-- CRT	TITLE - MINIATURE IMAGE DISPLAYS	FUNDING (\$000)				
			PRIOR	81	82	83	84
(503-4)		(CONTINUE())					850
		PROBLEM - NO PROBLEM GIVEN					
		SOLUTION - NO SOLUTION GIVEN					
(504-1)		MISSCELLANEOUS					
		(503-4) TITLE - MULTICOLOR GRAPHICS DISPLAY					1200
		PROBLEM - TACTICAL MANPACK COMM TERMINALS REQUIRE A LIGHTWEIGHT LOW POWER MULTICOLOR DISPLAY WHICH IS CAPABLE OF GRAPHICS AND IS LEGIBLE IN DIRECT SUNLIGHT. SUCH DISPLAYS ARE PRESENTLY AVAILABLE ONLY AS LABORATORY EVALUATION MODELS AT PROHIBITIVE EXPENSE.					
		SOLUTION - A MANUFACTURING METHODS PROGRAM MUST BE CONDUCTED SO THAT THESE DISPLAYS CAN BE MANUFACTURED IN LARGE QUANTITIES AT A PRICE WHICH WILL MAKE THEM FEASIBLE FOR TACTICAL USE WHERE THEY ARE FINALLY NEEDED.					
(505-1)		TITLE - MINIATURE FLAT PANEL 525-LINE DISPLAY					1000
		PROBLEM - COUPLING OF THE RESOLUTION OF THIS DISPLAY OVER THE 525-LINE DISPLAY WILL REQUIRE THE HIGH RESOLUTION ELECTRON LITHOGRAPHY OR X-RAY LITHOGRAPHY IN ORDER TO PRODUCE THEM WITH GOOD YIELD					
		SOLUTION - DEVELOP PRODUCTION METHODS INCLUDING FELCTION BEAM LITHOGRAPHY OR X-RAY LITHOGRAPHY FOR FLAT PANEL DISPLAYS.					
(505-1)		TITLE - INTEGRATED 675-LINE LIQUID CRYSTAL DISPLAY CHIP					900
		PROBLEM - THE FABRICATION OF LIQUID CRYSTAL-SILICON DISPLAY CHIPS WITH AN 8751163 FORMAT AND INTEGRATED IC/VI ELECTRONICS REPRESENTS A TREMENDOUS NUMBER OF ELEMENTS PER CHIP AND SIGNIFICANT YIELD PROBLEMS					
		SOLUTION - IMPROVE AND AUTOMATE CONTROL OF MULTI-STEP PROCESS FOR FABRICATING THE DISPLAY CHIPS AND ESTABLISH CAPABILITY FOR LARGER WAFERS WITH MORE CHIPS PER WAFER.					
		***** * AT COKY * ***** * ELECTRONICS *****					

FIVE YEAR PLAN
HCS DRCMT 126

COMPONENT --	TITLE --	FUNDING (\$000)					
		PRIOR	t1	t2	83	84	85

(5C1a) TITLE -- BUNDLED GRID CONVERGENT ELECTRON GUN

PROBLEM - PRESENT TECHNOLOGY CAN NOT BE USED TO BUILD GRIDED MILLIMETER WAVE TUBES. MUST USE HIGH VOLTAGE MODULATOR FOR PULSED OPERATION.

SOLUTION - THE PROCESSES OF CHEMICAL VAPOR DEPOSITION OF BORON NITRIDE, GRID FABRICATION AND BONDING OF GRIDS TO THE CATHODE BY LOW COST PRODUCTION TECHNIQUES WILL BE DEVELOPED.

(5C1g) TITLE -- LASER-CUT SUBSTRATES FOR MM TUBES

PROBLEM - PRESENT CFA JAMMER TUBES EMPLOY HIGH COST, PRECISION ANODE CIRCUITS LIMITING UTILIZATION IN OPTIMIZED FM SYSTEMS. HIGH PERFORMANCE AND LOW WEIGHT AT MINIMUM COST IS REQUIRED TO FIELD DESIRED EW SYSTEMS.

SOLUTION - UTILIZE LASER-CUT ANODE CIRCUIT SUBSTITUTES TO ACHIEVE DESIRED RF PERFORMANCE AND MINIMIZE PARTS AND OVERALL DEVICE COST. ALSO EMPLOY PHOTOLITHOGRAPHIC TECHNIQUES TO FORM MEANDERLINE CIRCUIT. USE PERYLIA SUBSTRATE MATERIAL FOR DIELECTRIC SUPPORTS.

(5C2a) TITLE -- MM-FERRULE CAVITIES FOR MM WAVE AMPLIFIER TUBES

PROBLEM - MILLIMETER RADARS REQUIRE LIGHT WEIGHT LOW COST TRANSMITTER TUBES TO PROVIDE SYSTEMS TO PENETRATE SMOKE AND FOG. PRESENT HAND MACHINING IS EXPENSIVE AND POOR TOLERANCE CONTROL AT MM DIMENSIONS RESULT IN HIGH COST TRANSMITTER TUBES EVEN IN LARGE QTY.

SOLUTION - COMPUTER CONTROLLED ZERO BLANK COINING AND LAPPING METHODS WOULD ELIMINATE COSTLY HAND FACH AND HAND STACKING OF CAVITIES SUITABLE FOR MILLIMETER WAVE TUBES. ADAPTING PRESENT TECH AND ASSEMBLY PROC TO ACHIEVE HIGH YIELD WILL PROVIDE A LOW COST TUBE.

(5C2f) TITLE -- LIGHTWEIGHT LOW COST JAMMER PACKAGE

PROBLEM - MANUAL ASSEMBLY OF A LARGE NUMBER OF PIECE PARTS MAKES TUBES EXPENSIVE. A LARGE AMOUNT OF HIGHLY SKILLED LABOR IS REQUIRED TO PERFORM THIS TYPE OF INITIATIVE TESTS.

SOLUTION - USE AUTOMATIC CONTROL FOR TEMPERATURE AND VACUUM PROCESSING. FABRICATION OF HELIX CIRCUIT AND SUPPORT RODS, AND DEPOSITION OF ATTENUATOR MATERIAL ON THE SUPPORT RODS. USE AUTOMATIC TESTING.

(5C3a) TITLE -- MM WAVE CURVED CHANNEL MCP'S

PROBLEM - CURVED CHANNEL MCP'S PREVENT FEEDBACK TO THE PHOTOCATHODES. THIS IS ELIMINATED BY THE NEED FOR AN ION CARRIER FILM. CURVED CHANNEL MCP'S HAVE BEEN MADE WITH CRUCIAL EXPENSIVE LAP TECHNIQUES. LOW COST, HIGH QUALITY MCP'S ARE NEEDED FOR MM WAVE CURVED CHANNEL MCP'S.

SOLUTION - ESTABLISH MANUFACTURING PROCESS FOR LOW COST FABRICATION.

	TITLE	CATOG E	FUNDING (\$C'00)			
			F1	F2	F3	F4
(CONTINUE:)						
(5111) TITLE - VAPOR ORGANIC METALLIC EPITAXIAL GROWTH PROCESS						
PROBLEM - LIQUID EPITAXIAL GROWTH PROCESS REQUIRES: A) LARGE AND COSTLY HIGH TEMP REACTORS, B) LARGE QUANTITIES OF SATURATION MELT MATERIALS, C) COSTLY QUALITY CALCIUM ARSENIDE SUBSTRATES, D) LENGTHY OPERATION PROCESS PER SINGLE GROWTH.						
SOLUTION - THE VAPOUR-ORGANO-METALLIC PROCESS WILL ENABLE MINIMUM FACILITATION REQUIREMENTS, USE OF CONTROLLED CASES REQUIRING NO MELT MATERIALS, POSSIBLE USE OF LESS EXPENSIVE SUBSTRATES, AND MULTIGROWTH PROCESS.						
(5117) TITLE - FIELD EMISSION ELECTRON LENS						
PROBLEM - TECHNOLOGY TO BUILD HIGH CURRENT DENSITY LOW VOLTAGE MODULATION ELECTRON GUNS FOR HIGH POWER SUBMILLIMETER WAVE TUBES IS NOT AVAILABLE.						
SOLUTION - DEVELOP TECHNIQUES FOR MANUFACTURING HIGH CURRENT DENSITY LOW VOLTAGE ELECTRON GUNS FOR SUBMILLIMETER ELECTRON GUNS CAPABLE OF OPERATING FOR HUNDREDS OF HOURS.						
(5127) TITLE - REUSABLE LOW FEEDBACK MICROCHANNEL PLATES						
PROBLEM - EXTEND TUBE LIFE BY LOWERING CATHODE VOLTAGE AND SIMPLIFYING VACUUM PROCESSING AND FABRICATION TECHNIQUES.						
SOLUTION - DEVELOP TECHNIQUES TO PRODUCE THIS TYPE MICROCHANNEL PLATE WITH INCREASED TUBE YIELD.						
(5131) TITLE - CCD IMAGER FOR 1-2 MICRON WAVELENGTH REGION						
PROBLEM - CURRENT TECHNIQUES FOR PRODUCTION ARE COSTLY.						
SOLUTION - DEVELOP PRODUCTION TECHNIQUES TO FABRICATE THESE DEVICES IN A COST-EFFECTIVE MANNER.						
***** * C A T E G O R Y * ----- *FREQUENCY CONTROL *****						
COMPONENT -- CRYSTALS						
(5055) TITLE - HI RELIABILITY GENERAL PURPOSE CRYSTALS						
PROBLEM - CRYSTALS USED IN HIGH RELIABILITY TACTICAL RADIOS HAVE A HIGH FAILURE RATE DUE TO FREQUENCY VARIATIONS WITH TIME, TEMPERATURE, SHOCK, AND VIBRATION. LEAKS INTO THE ENCLOSURE ARE A MAJOR PROBLEM.						
SOLUTION - PRODUCTION ENGINEERING WILL CLOSELY CONTROL CRYSTAL PLATE GEOMETRY, ORIENTATION, MOUNTING, HERMETIC SEALING AND TESTING OF AT-CUT CRYSTALS.						

MPT FIVE YEAR PLAN
RCS DRMT 126

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)				
				PRIOR	81	82	83	84
(CONTINUE()								
(501.9) CRYSTALS	TITLE - FABRIC OF OVERTONE MINIATURE PRECISION CRYSTALS	PROBLEM - MINIATURIZED PRECISION QUARTZ CRYSTALS IN MICROCIRCUIT PACKAGES ARE FRAGILE AND DIFFICULT TO FABRICATE.	SOLUTION - IMPROVE PRODUCTION TECHNIQUES FOR MINIATURE OVERTONE QUARTZ CRYSTALS THROUGH BETTER POLISHING, HANDLING, MOUNTING/BONDING AND PACKAGING TECHNIQUES.	600				
(513.4) HIGH PURITY LGN DISLOC ATTCH QUARTZ								
		PROBLEM - COMMERCIALLY AVAILABLE QUARTZ CONTAINS IMPURITIES AND DISLOCATIONS WHICH MAKE THE MATERIAL UNSUITABLE FOR RESONATORS TO BE USED IN SPREAD SPECTRUM SYSTEMS. THIS IS ESPECIALLY TRUE IN RADIATION ENVIRONMENTS.						
		SOLUTION - ESTABLISH A CAPABILITY FOR MANUFACTURING HIGH PURITY AND LOW DISLOCATION DENSITY QUARTZ.						
(567.6) STANDARD FREQUENCY/TIME MODULES								
	TITLE - MICROWAVE TIME OF DAY SOURCE	PROBLEM - MICROWAVE PRECISION TIME OF DAY SIGNAL SOURCES FOR OPERATOR INITIATED SECURE NET ENTRY PROCEDURES ARE NOT AVAILABLE.	SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR A MICROWAVE PRECISION TIME BASE REFERENCE OSCILLATOR TO BE USED IN ECCM COMMUNICATION RADIO SETS.	500				
***** C A T E G O R Y *****								
	GENERAL							

NPT FIVE YEAR PLAN
RCS CRCT 126

FUNDING (\$000)

	P1	P2	P3	P4	P5
PRIOR					

(C-17) TITLE: - MILLIMETER WAVE FILTER SURFACE MOUNTING

SOLUTION - DEVICE PARAMETERS VARY GREATLY FROM UNIT TO UNIT. PACKAGING METHODS ARE UNSATISFACTORY FOR COMBINER CIRCUITS. TUNING COMBINER ELEMENTS AND ADJUSTING ASSOCIATED MULTILAYER CIRCUITS TAKES WEEKS OF EFFORT TO OBTAIN REQUIRED PERFORMANCE LEVELS.

SOLUTION - OPTIMIZE FABRICATION PROCESS AND ESTABLISH TECHNIQUES OF DIODE AND PACKAGE PRODUCTION RESULTING IN HIGH YIELDS OF REPRODUCIBLE COMBINER USABLE DEVICE. OPTIMIZE COMBINER CIRCUITS AND MODULATORS FOR HIGH PERFORMANCE AND UNCOMPLICATED TUNING.

(C-18) TITLE: - INTRINSICALLY TEMPERATURE-COMPENSATED MAGNETS

SOLUTION - PRESENT RAYLEIGH MAGNETS HAVE TOO HIGH A TEMPERATURE COEFFICIENT OF REVERSIBILITY MAGNETIZATION FOR USE IN ACCELEROMETERS/GYROSCOPES NEEDED IN MILITARY AND MINI-TV SYSTEMS AND IN SOME NEW MILLIMETER WAVE TRAVELING WAVE TUNING DESIGNES.

SOLUTION - DEVELOP USA MANUFACTURING CAPABILITY FOR SAMARITAN-MAGNET-CORAL-SEVENTEEN-HEATED MAGNETS WITH GADOLINIUM-DYSPROSIIUM OR SEIGUUM AND TRANSITION METAL SUBSTITUTES WHICH YIELD ZERO TEMPERATURE COEFFICIENT OF MATERIALS WITH HIGH ENERGY PRODUCTS.

(C-19) TITLE: - RELIABLE DEVICES FOR MILLIMETER APPLICATIONS

SOLUTION - RELIABLE DEVICES FOR 35 TO 44 GH FREQUENCIES ARE DIFFICULT TO FABRICATE AND ARE LIMITED IN THEIR PERFORMANCE. REPRODUCIBLE, HIGH PERFORMING, CHARACTERISTICS ARE DIFFICULT TO ACHIEVE DUE TO SMALL SIZE CROSSLINKS AT THESE FREQUENCIES.

SOLUTION - USING NEW DESIGN AND FABRICATION PROCEDURES, RELIABLE FERRITE PHASE SHIFTERS FOR PHASED ARRAY ANTENNAS AND CIRCUITRIES WILL BE PRODUCED.

DISCUSSION - 1 -- MISCELLANEOUS

(C-20) TITLE: - SYNTHETIC HYDROXY QUARTZ CIRCUITS

SOLUTION - POLYCRYSTALLINE CHIP TAPE CARRIER TECHNIQUES OFFER LOW COST ASSEMBLY AND ENVIRONMENTAL PROTECTION OF INTEGRATED CIRCUIT CHIPS ON HYDROXY QUARTZ CIRCUITS. SILVER TAB ATTACHMENT OF DISCRETE TRANSISTOR AND DIODE CHIPS IS NOT CONVENTIONALLY FEASIBLE.

SOLUTION - FABRICATION PRODUCTION TECHNIQUES FOR SEALING AND HANDLING MISCELLANEOUS DEVICE CHIPS INCLUDING TESTING AND PACKAGING OF CHIPS TO HYDROXY QUARTZ CIRCUITS.

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* 5. *

150-1
MST FIVE YEAR PLAN
FCS DRC/MT 126

FUNDING (\$000)

COMPONENT -- CIRCUITRY

	PRIOR	R1	R2	R3	R4	R5
(5007) TITLE: - LOW COST HYBRID MICROCIRCUIT MOLECLES	1000					

PROBLEM - HYBRID MICROCIRCUITS WITH MANY LSI, VLSI AND VHSIC CHIPS ON A THICK FILM INTERCONNECT LARGE AREA SUBSTRATE REQUIRE NEW INTERCONNECTION AND SEALING CONCEPTS FOR HIGH SIGNAL PROCESSING.

SOLUTION - ESTABLISH LOW COST MANUFACTURING PROCESSES FOR LARGE AREA HYBRID MICROCIRCUITS IN MODULE FORM, REPLACING FC BOARDS AND WHICH INCLUDE INTERCONNECT, SEALING AND PACKAGING SCHEMES FOR MICROWAVE HIGH SPEED AND CONVENTIONAL SIGNAL PROCESSING.

(5008) TITLE: - CHARGE COUPLED DEVICE SILICON PROCESSORS

PROBLEM - EXTENSIVE ENGINEERING WORK IS REQUIRED TO INCORPORATE ANY CCD PROCESSING DEVICE INTO A SYSTEM. ALL INTERFACE CIRCUITY MUST BE ESPECIALLY DESIGNED AND ASSEMBLED. THERE ALSO EXISTS A VERY LIMITED SELECTION OF COMMERCIAL CCD DEVICES.

SOLUTION - ESTABLISH PRODUCTION TECHNIQUES FOR DESIGN AND FABRICATION OF INTEGRATED CIRCUITS CONTAINING IN ONE CHIP CCD DEVICES, ANALOG CIRCUITRY, AND DIGITAL CIRCUITRY TO PERFORM ALL UNIQUE INTERFACE FUNCTIONS.

(5009) TITLE: - HIGH SPEED DIGITAL HYBRID MICROCIRCUITS

PROBLEM - HIGH SPEED DIGITAL IC'S, PACAR, VHSIC ARE LEADING TO USE OF DIGITAL TECHNIQUES FOR FRONT END USE IN DIRECT SIGNAL PROCESSING REQUIRE MANY INTERCONNECTIONS BETWEEN ARRAYS OF HIGH SPEED DIGITAL IC'S AND HIGH FREQUENCY TRANSMISSION TECHNIQUES.

SOLUTION - ESTABLISH MANUFACTURING PROCESSES AND FACILITIES FOR NEW HYBRID MICROCIRCUIT HIGH SPEED PACKAGING TECHNOLOGIES WHICH ARE CAPABLE OF PROVIDING THE REQUIRED HIGH FREQUENCY TRANSMISSION.

(500A) TITLE: - MONOLYTIC K-RAND TRANSISTOR RECEIVER

PROBLEM - REDUCE TO EXECUTION ENVIRONMENT RESULTS OF PRIOR R&D TO DEVELOP COMPLETE MICROWAVE TRANSMITTER AND RECEIVER ON A CHIP OF GALLIUM ARSENIDE. TIGHT CONTROL OF LITHOGRAPHIC, THERMAL, AND MATERIALS PROCESSES TO 2 PCT. OR BETTER AT&T FOR COST/YIELD GOAL.

SOLUTION - USE OF HIGH VOLUME AUTOMATED PROCESSES TO REPRODUCIBLY BATCH FABRICATE CIRCUITS ON ZINC-GALLIUM-ARSENIDE WAFERS. AUTOMATE TESTING AND ESTABLISH PACKAGING TECHNIQUES AMENABLE TO VOLUME PRODUCTION. COST AND YIELD GOALS TO BE REACHED THAN NOW POSSIBLE.

(500B) TITLE: - OPTIC DISPLAY EXPANDERS

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

700

1000

1000

900

NET FIVE YEAR PLAN
RCS LFACT 126

FUNDING (\$000)

FFIUR 81 82 83 84 85

COMPONENT -- CIRCUITRY

(511-1) TITLE - DATA AND COMMUNICATIONS SYNTHESIZER

PROBLEM - FREQUENCY SYNTHESIZERS ARE AN ESSENTIAL COMPLEMENT OF VIRTUALLY ALL MILITARY COMM. AND DATA LINK EQUIPMENT. PRESENT SYNTHESIZERS ARE TOO COSTLY, LARGE, AND REQUIRE EXCESSIVE POWER FOR BATTERY OPERATION.

SOLUTION - DEVELOP A SET OF CIRCUITS WHICH CAN BE CONFIGURED TO SATISFY A WIDE VARIETY OF REQUIREMENTS. THE CIRCUITS WILL BE FABRICATED USING AN ADVANCED LOW POWER TECHNOLOGY AND USED IN LARGE QUANTITIES TO ASSURE LOW COSTS.

(511-2) TITLE - X-RAY LITHOGRAPHIC PRODUCTION TECHNIQUES FOR VHIC

PROBLEM - VHIC'S AND OTHER PROGRAMS WILL DEVELOP PROCESS FOR SUBMICRON HIGH SPEED SIGNAL PROCESSORS. POOR YIELD AND LACK OF PRODUCTION TYPE EQUIPMENT RESULTS IN VERY HIGH COST AND LOW RELIABILITY.

SOLUTION - DEVELOP EQUIPMENT AND PROCESSES TO IMPLEMENT VHIC'S ON THE PRODUCTION LINE. INSTITUTE PROCESS CONTROLS TO IMPROVE YIELD. DEVELOP SCANNING AND PRODUCTION TECHNIQUES TO ENHANCE RELIABILITY.

(511-3) TITLE - LOW-COST SAPPHIRE SUBSTRATES FOR CMOS CIRCUITS

PROBLEM - SOS IC SUBSTRATES MADE FROM SAPPHIRE BULLES ARE COSTLY AND IN LIMITED SUPPLY DUE TO SUBSTRATE PREP OPERATIONS ARE LOW PRODUCTIVITY. CAPABILITY. SOSS IC'S ARE NEEDED FOR HIGH SPEED LOW POWER USE BUT CANNOT BE MADE IN QUANTITY WITHOUT LOW COST SUBSTRATES.

SOLUTION - DEVELOP PRODUCTION METHODS (LOW COST HIGH THROUGHPUT) FOR SUBSTRATES MADE FROM SAPPHIRE RIBBONS.

(511-4) TITLE - OPTIMIZED SUBSTRATES FOR HYBRID MICROCIRCUITS

PROBLEM - DEVELOPING HIGH DENSITY HYBRIDS, HIGH SPEED HYBRIDS, AND HIGH WATTAGE HYBRIDS REQUIRE GREAT REQUIREMENTS FOR SUBSTRATE DIMENSIONAL STABILITY, THERMAL CONDUCTIVITY, ELECTRICAL PERFORMANCE, PRODUCIBILITY AND COST.

SOLUTION - OPTIMIZE TWO MAJOR FORMS OF SUBSTRATE-IN INSULATED METAL AND ORGANIC. ESTABLISH WHICH FROGABILITY, YIELD AND PERFORMANCE PARAMETERS. IDENTIFY OPTIMUM METAL SUBSTRATE BASES, INSULATION AND OPTIMUM REFINING FIGURES AND DESIGN PLUNDERS.

(511-5) TITLE - HIGH RELIABILITY VHIC PACKAGE

PROBLEM - SILICON VHIC'S FOR MILITARY SPECIAL PROCESSORS ARE SUBJECT TO FAULTY FAILURE DUE TO INACCESSIBLE INTERFACIAL APIRESSES ON CHIP DIFFUSIONICS. ALSO DESIGN, OUTPUT IN THE YIELD AND HIGH COST.

SOLUTION - DEVELOP PRODUCTION FEATURES FOR HIGH QUALITY GATE DIFFUSIONICS TO CUSTOMIZE FOR MILITARY VHIC'S. DEVELOP ALTERNATIVE SERVICE FABRICATION PROCESS. IMPROVE THE RELIABILITY OF MOUNTING, INSULATION, IN VEHICLE MANUFACTURE.

700

700

700

700

MVI FIVE YEAR PLAN
RCS ORCMT 126

COMPONENT	-- CIRCUITRY	(CONTINUED)	FUNDING (\$000)					
			PRIOR	R1	R2	R3	R4	R5
(5130) TITLE	- VHASIC FABRICATION USING ELECTRON BEAM TECHNOLOGY		850					
PROBLEM	- SUBMICRON INTEGRATED CIRCUIT FABRICATION METHODS HAVE BEEN DEVELOPED FOR DEVICES HAVING CONDUCTIVE SILICON SUBSTRATES. OTHER CHOICES OF LOW CONDUCTIVITY SUBSTRATES CAN NOT BE USED BECAUSE PROCESS CONDITIONS HAVE NOT BEEN DEVELOPED.							
SOLUTION	- USING SILICON CN SAPPHIRE OR GALLIUM ARSENIDE SUBSTRATES SUBMICRON INTEGRATED CIRCUIT DEVICE PRODUCTION PROCESSES WILL BE DEVELOPED INCORPORATING DIRECT WRITE ELECTRON BEAM PATTERNING							
(995) TITLE	- LOW COST MONOLITHIC GALLIUM ARSENIDE MM INTEG CKTS		1179					
PROBLEM	- SIZE WEIGHT COST CONSTRAINTS LIMIT APPLICATION OF MICROWAVE ICS FOR MANY SYSTEMS APPLICATIONS. DRAMATIC REDUCTIONS PARTICULARLY COST ARE POTENTIALLY AVAILABLE ALONG WITH ORDER OF MAGNITUDE RELIABILITY IMPROVEMENT.							
SOLUTION	- ESTABLISH PRODUCTION CONTROLS FOR BATCH FABRICATION OF GALLIUM ARSENIDE MONOLITHIC CIRCUIT FUNCTIONS DRAW ON PRIOR R&D AND MMT EFFORTS IN E-TEAM, ION IMPLANT, AND VAPOR EPI TO FULLY AUTOMATE PRODUCTION OF AMPLIFIER AND RECEIVER FUNCTIONS.							
(999) TITLE	- PRODUCTION TECHNIQUES FOR Si MM PWR TRANSISTORS		863					
PROBLEM	- AS THE CONCENTRATION OF INTEGRATED CIRCUITS INCREASES THE HEAT DENSITY IS REACHING THE POINT WHERE IT WILL DESTROY THE SEMICONDUCTOR DEVICES.							
SOLUTION	- REPLACE THE PRESENT PACKAGING DEVICES WITH UNITS HAVING A HIGH PERCENTAGE OF DIAMOND MATERIAL SO AS TO ACHIEVE A GREATER THERMAL TRANSMISSION.							
COMPONENT	-- MEMORY							
(HHS) TITLE	- TAB LEAD BONDING MANUFACTURING INSPECTION		300					
PROBLEM	- PRESENT METHODS USED TO EVALUATE AND CERTIFY WIRE BONDING IN MICROELECTRONICS ARE NOT READILY APPLIED TO TAB AUTOMATED BONDING (TAB). MILITARY SCREENING METHODS DO NOT ADDRESS CONFIGURATIONS USED IN TAB AND WOULD MINIMIZE MANY OF THE TAB ADVANTAGES.							
SOLUTION	- AN INSPECT/VERIFY SYS FOR TAB WHICH INCORPORATES CCTV PATTERN RECOGNITION, TO VERIFY BEAM POSITION AND SENSORS TO DETERMINE BEAM HEIGHT. APPLY A SCANNING LASER ACUSTIC MICROSCOPE IN A NON-DESTRUCTIVE ANALYSIS AND EVALUATION OF THE TOTAL STRUCTURE.							

NET FIVE YEAR PLAN
RCS ERGMI 176

FUNDING (\$000)

COMPONENT	Prior	E1	E2	E3	E4	E5
MEMORY						

(CONTINUED)

(511) TITLE - COST EFFECTIVE MILITARY MEMORIES

PROBLEM - MILITARY ENVIRONMENTAL CONSTRAINTS CAUSE LOW SCREENING YIELDS AND HIGH COSTS IN HIGH DENSITY MILITARY MEMORY CHIPS, FORCING INCREASED USE OF HIGH-MILITARIZED PARTS WITH INEFFICIENT RISKS FOR SYSTEMS RELIABILITY.

SOLUTION - YIELD IN MILITARY MEMORY PRODUCTION WILL BE IMPROVED SIGNIFICANTLY BY DESIGNING REDUNDANCY INTO CIRCUITRY AND INTERCONNECTING WORKING SECTIONS AFTER TEST. PROGRAM WILL DEVELOP TECHNIQUES FOR ADAPTIVE DESIGN AND CONNECTING OF REDUNDANT SUBSECTIONS.

* C A T T O R Y *
* LASER *

COMPONENT -- GENERAL

(512) TITLE - 10.6 MICRON CO₂ LASERS

PROBLEM - LASERS CONSTRUCTED IN UNIT QUANTITIES ARE EXPENSIVE AND VARY IN SPECIFICATIONS. PRESENT RANGE FINER LASERS HAVE REQUIRED ALL WEATHER CAPABILITIES AND ARE INEFFECTIVE AGAINST COUNTMEASURE SMOKES.

SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.

(513) TITLE - 10-MICRON PULSED WAVEGUIDE LASER

PROBLEM - PRESENTLY PULSED WAVEGUIDE CARBON DIOXIDE LASERS FOR USE AS SOURCES FOR MISSILE BEAMRIDERS AND BEACONS ARE FABRICATED IN SMALL QUANTITIES BY HIGHLY SKILLED PERSONS. ELECTRODES, MIRRORS, AND CERAMIC CAVITY HOUSING REQ. PRECISE FABRICATION AND ASSY.

SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.

(514) TITLE - 16 WATT COHERENT CO₂ LASER SOURCE

PROBLEM - PRESENT METHODS FOR BUILDING LASER SOURCES ARE LARGELY HAND METHODS USED ON SMALL QUANTITIES OF COMPONENTS.

SOLUTION - DEVELOP MANUFACTURING TECHNIQUES FOR A 10 WATT LASER WITH A HIGH DEGREE OF SHORT TERM STABILITY FOR CURRENT DETECTION APPLICATION, INCLUDING IR RADAR.

R00

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500

MMI FIVE YEAR PLAN
RCS FRM/T 126

FUNDING (1600)

PRIOR 81 62 83 84 85

(CONTINUED)

700

COMPONENT -- GENERAL

(5115) TITLE - FAR INFRARED LASER JAMMER SOURCE

PROBLEM - CAN LASER SOURCES MUST BE USED FOR OPTICAL COUNTERMEASURES AGAINST THERMAL IMAGERS AND OTHER FIR Devices.

SOLUTION - DEVELOP COST-EFFECTIVE PRODUCTION TECHNIQUES.

(5116) TITLE - HIGH POWER TUNABLE LONG WAVELENGTH INJECTION LASER

PROBLEM - FEW PRODUCTION METHODS HAVE BEEN DEVELOPED FOR HIGH POWER INJECTION LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITIES FOR FABRICATING SINGLE AND STACKED INJECTION LASERS AT LONG WAVELENGTH FOR USE IN ADVANCED FIBER OPTICS COMMUNICATION, TRAINING DEVICES AND RANGEFINDERS.

COMPONENT -- MATERIALS

(5117) TITLE - QUATERNARY INJECTION LASERS

PROBLEM - NO VOLUME PRODUCTION METHODS EXIST FOR PRODUCING TRAINING LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITY FOR INJECTION LASERS FROM VAPOR PHASE EPITAXY FABRICATION METHOD FOR USE IN FIBER-OPTIC COMMUNICATION DEVICES AND EYE-SAFE TRAINING DEVICES.

COMPONENT -- MODULES

(5118) TITLE - MINI LASER TRANSMITTER MODULE

PROBLEM - PRESENT LASER TRANSMITTER MODULES FOR MINI LASER SYSTEMS MUST BE ASSEMBLED IN A LAB ENVIRONMENT FROM MANY DISCRETE E-O COMPONENTS AND ARE NOT DESIGNED FOR PRODUCTION.

SOLUTION - DEVELOP PRODUCTION METHODS FOR MANUFACTURE AND ASSEMBLY OF MINIATURE E-O COMPONENTS USING IC NETWORKS, COMBINED HF/HF LASER ACOUSTIC RESONATOR COMPONENTS AND OTHER MFG TECHNIQUES TO FABRICATE AND ASSEMBLE IN A PRODUCTION ENVIRONMENT.

COMPONENT -- FOCUS

(5119) TITLE - CONSTANT COMPOSITION GROWTH OF NEODIMIUM FOULFS

PROBLEM - HIGH QUALITY NEODYMIUM FOULFS ARE EXTREMELY DIFFICULT TO GROW, EVEN AFTER TWO PREVIOUS MFG EFFORTS TO INCREASE SIZE AND YIELD.

SOLUTION - DEVELOP A CONTINUOUS GROWTH PROCESS BY WHICH CRYSTAL FOULFS OF CONSTANT COMPOSITION, OR "E-T", IS ACCOMPLISHED. THIS IS THE ONLY HOPE FOR Meeting Increased MILITARY AFENT DEMAND IN THE FUTURE TIME-FRAME.

COHORT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)			
				P1	P2	P3	P4
504	504) TITLE - BROADBAND MID INFRARED SOURCE	PROBLEM - UNIQUE GEOMETRICAL SHAPE IS MUST BE FABRICATED AND ASSEMBLED IN SOURCE PRODUCTION. HIGH COST RESULTS FROM EXTENSIVE MANUAL LABOR CONTENT. THE TECHNIQUE FOR PRODUCING THE REFRACTORY Emitter MATERIAL IS MARGINAL IN MATERIAL REPRODUCIBILITY.	SOLUTION - ESTABLISH AUTOMATED TECHNIQUE FOR PRODUCING Emitter AND HEATER ELEMENTS. ESTABLISH CONTROL OF PROCESS PARAMETERS THAT WILL RESULT IN IMPROVED YIELD OF REFRACTORY Emitter.	78			
5046	5046) TITLE - NON-LINEAR GAIN MCP'S FOR ZRL GEN. IMAGE INTENSIFIER	PROBLEM - ZRL GEN TUBES REQUIRE NON-LINEAR GAIN MCP'S TO SUPPRESS BRIGHT HORIZON SKY OR OTHER BRIGHTEST IMAGES WHILE PROVIDING FULL GAIN IN DARK SCENE AREAS. PRESENT MANUF. METHODS FOR MCP ONLY PRODUCE MCP WITH LINEAR GAIN IN THE NORMAL OPERATING RANGE.	SOLUTION - ESTABLISH A NEW HIGH VOLUME MANUFACTURING PROCESS CONTROL TO ACCURATELY CONTROL NON-LINEAR GAIN CHARACTERISTICS OF THE MCP WHILE MAINTAINING ALL PARAMETERS SUCH AS LOW NOISE, KLEMMES, FIXED PATTERN NOISE AND ION RAFFER PROTECTION.	78			
5061	5061) TITLE - MULTI-SPECTRAL COATINGS						
		PROBLEM - DOUBLE BAND PASS 0.6 AND 4-14 MICRON MULTI-LAYER COATINGS MUST BE PRODUCED ON VARIOUS OPTICAL MATERIALS. THESE COATINGS MUST MEET MIL. STANDARDS FOR HARDNESS WHICH IS A FUNCTION OF THE PROCESS.	SOLUTION - SIMPLIFY PROCESS CONTROLS MUST BE ESTABLISHED. MINIMUM TIME BETWEEN LAYER DEPOSITION MUST BE ACHIEVED AND PRODUCTION TECHNIQUES MUST BE DEVELOPED.				
5062	5062) TITLE - INTEGRATED OPTICS BUILDING BLOCK - PHASE I						
		PROBLEM - NO PROFILE GIVEN	SOLUTION - NO SOLUTION GIVEN				
5076	5076) TITLE - PLASTIC IR OPTICAL MATERIAL						
		PROBLEM - INJECTION MOLDING OF NEW MATERIALS USEFUL IN IR PORTION OF SPECTRUM MUST BE ACCOMPLISHED IN PRODUCTION FACILITIES. OPTICAL ELEMENTS MUST BE LARGE, HOMOGENEOUS AND POSSESS THE PROPER SURFACE FIGURE.	SOLUTION - PRESSURE, TEMPERATURE, COOLING CYCLE, FLOW RATE MUST BE PRECISELY DETERMINED TO INSURE LOW COST PLASTIC OPTICS FOR FLIR LENSES.				

MPT FIVE YEAR PLAN
RCS DRCMT 126

COMPONENT --	TITLE	FUNDING (\$000)			
		PRIOR	81	82	83
WINDOWS/LENSSES					85

(CONTINUED)

(5152) TITLE - PLASTIC OBJECTIVE FOR IMAGE INTENSIFIER SYSTEMS

PROBLEM - METROLOGY PROBLEMS HAVE SURFACED IN THE MANUFACTURE OF PLASTIC OBJECTIVE LENSES IN THE ANVIS EL PROGRAM WHICH WILL INCREASE THE UNIT PRODUCTION COST BY FORCING THE USE OF GLASS LENSES. AND ELIMINATE THE WEIGHT ADVANTAGE.

SOLUTION - MANUFACTURING METHODS WILL BE ESTABLISHED FOR NEW METROLOGY OF PLASTIC LENS ELEMENTS WHICH WILL BE UTILIZED TO COMPLETE THE MANUFACTURE OF TMF SINGLE CAVITY INSERTS REQUIRED FOR PRODUCTION FOR THE AN/AVS-6, AN/PVS-7, AND AN/PVS-5.

(5153) TITLE - COMPUTER-AIDED FLIR ASPHERIC LENS FABRICATION

PROBLEM - ASPHERIC LENSES REQUIRED BY FLIR SENSORS HAVE SEVERE WEIGHT AND SIZE LIMITATIONS AND ARE DIFFICULT TO MFG. BECAUSE OF THE REPETITIVE PROCESS OF SURFACE SHAVING.

SOLUTION - PROVIDE MANUFACTURING METHODS FOR PRODUCING ASPHERICAL FLIR LENSES USING A SINGLE POINT CERAMIC TURNING LATHE INTEGRATED WITH COMPUTER CONTROLS AND LASER INTERFEROMETRIC FEEDBACK OF CUTTING TOOL POSITION.

* C A T E G O R Y *

* >ASSIVE CCMPONENTS *

COMPONENT -- MISCELLANEOUS

(5159) TITLE - ULTRAWIDE BANDWIDTH SAW DELAY LINES

PROBLEM - BRUGS AND SAW DELAY LINES ARE REQUIRED FOR SIGNAL STORAGE DEVICE BANDWIDTH IS FIXED BY NEED TO STORE SIGNALS FOR A TEN MICROSECOND DURATION FOR SIGNALS RANGING OVER 500 MHZ BAND. DEVICE INSERTION LOSS AND MULTIPLE TRANSMIT REFLECTIONS MUST BE MINIMAL

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR SAW DELAY LINES OPERATING AT 1GHZ USING IDENTICAL BROADBAND, NON-PERIODIC INTERDIGITAL TRANSDUCERS ON LITHIUM NIOBATE SUBSTRATES. HIGH RESOLUTION PHOTOLITHOGRAPHIC FABRICATION WILL USE DIRECT PROJECTION PRINTING.

* C A T E G O R Y *

* >POWER SOURCES *

PMT FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$000)

PRIOR 61 82 83 84 85

SECTION -- MISCELLANEOUS

(522) TITLE - MM RADAR MODULATOR FOR MINI-RFV AND TUE'S

PROBLEM - MM RADAR MODULATORS CAPABLE OF SURVIVING A RUGGED ENVIRONMENT WITH HIGH RELIABILITY REQUIRE COMPONENTS OF RUGGED DESIGN. PULSE SHARPENING TECHNIQUES, PULSE CHARGING, AND NANOSECOND PULSE TRANSFORMER MUST BE COMBINED INTO ONE UNIT.

SOLUTION - FABRICATE IN QUANTITY MM RADAR MODULATOR UTILIZING RECENT COMPONENT IMPROVEMENTS TO MEET MILITARY REQUIREMENTS WITH THE BEST EFFICIENCY, RELIABILITY, COST, WEIGHT POSSIBLE.

CATEGORY

SOLID STATE

COMPONENT -- DIODES/RECTIFIERS

(531) TITLE - MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES

PROBLEM - INADEQUATE CONTROL OF EPI MATERIAL AND DEVICE PROCESSING STEPS REQUIRING CLOSE TOLERANCES FOR EFFICIENT MM OPERATION RESULTS IN LOW YIELD, POOR UNIFORMITY AND HIGH UNIT COST FOR MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES.

SOLUTION - PRODUCTION ENGINEERING IN SPATIAL MATERIAL PREPARATION, INJECTION-LIMITED CONTACT FORMATION, INTEGRAL HEAT SINK TECHNOLOGY AND PACKAGING WILL ESTABLISH MMF TECHNIQUES AND CONTROLS RESULTING IN A COST REDUCTION OF MORE THAN TEN TO ONE.

(532) TITLE - MILLIMETER WAVE MIXERS AND AMPLIFIERS

PROBLEM - LOW NOISE RUGGEDIZED REPRODUCIBLE MIXERS ARE NEEDED FOR RECEIVERS FOR AIRBORNE ELECTRONIC WARFARE TERMINAL HOMEING AND MISSILE GUIDANCE.

SOLUTION - IN SITU CONSTRUCTION AND TESTS WILL PROVIDE REPRODUCIBLE UNITS AT FAIR PRICES FROM \$100 UP TO \$1000 MM. NEW TECHNOLOGIES TO BE DEVELOPED INCLUDE: EPOXY LITHOGRAPHY AND COMPUTER CONTROL OF MATERIALS GROWTH.

(534) TITLE - IMPATT DIODE SOURCES (94 47)

PROBLEM - HIGH RELIABILITY DIODE SYSTEMS OPERATING AT 94 GHZ REQUIRE HIGH PERFORMANCE LOW COST TREATMENT SOURCE (E.G. DIODE SOURCES). ADVANCED IMPATT DIODE MANUFACTURE TECHNIQUES CURRENTLY UNDER DEVELOPMENT WILL BE IMPLEMENTED.

SOLUTION - ADVANCED MANUFACTURE TECHNIQUES INCLUDING MOLECULAR BEAM SPUTTERING, CASTING AND STAMPING PROCESSOR FABRICATION AND REAM LEAD FABRICATION IN FLUID-BASED PACKAGING. WILL BE UTILIZED. HIGHER YIELDS, LOWER COST AND AFFECTING WEIGHT WILL RESULT.

FUNDING (\$000)

650

PRIOR

61

82

83

84

85

MAT FIVE YEAR PLAN
KCS DRCY 126

FUNDING (\$000)

COMPONENT	PRIOR	81	82	83	84	85
-- MISCELLANEOUS						

COMPONENT

-- MISCELLANEOUS

(5053) TITLE - MILLIMETER-WAVE INTEGRATED CIRCUIT TRANSCIVERS

PROBLEM - MILLIMETER WAVE DIELECTRIC WAVEGUIDE INTEGRATED TRANSCIVER MODULES IN THE 90 TO 220 GHZ REGION ARE DIFFICULT TO FABRICATE AND LIMITED IN PERFORMANCE. REPRODUCIBLE HIGH PERFORMANCE CHARACTERISTICS ARE DIFFICULT TO ACHIEVE WITH PRESENT DESIGN.

SOLUTION - ESTABLISH IMPROVED DESIGN TECHNIQUES FOR INTEGRATED MILLIMETER WAVE DIELECTRIC WAVEGUIDE STRUCTURES SO THAT RELIABLE, HIGH PERFORMANCE TRANSCIVER MODULES CAN BE FABRICATED IN LARGE QUANTITIES AT MINIMUM COST.

COMPONENT

-- SWITCHES

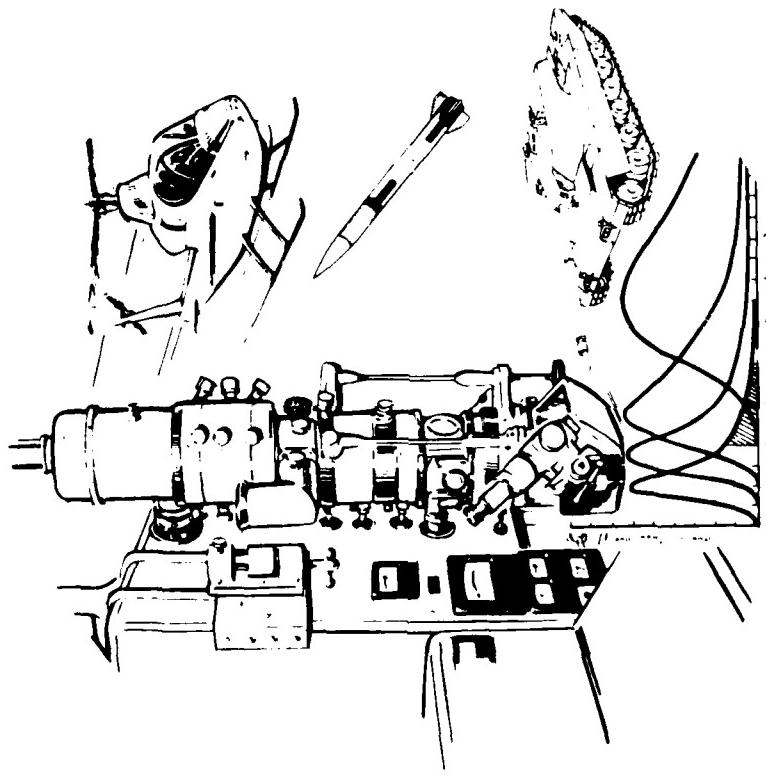
(5031) TITLE - LONG LIFE SPARK GAP

PROBLEM - LASER PULSES FOR RANGEFINDERS AND DESIGNATORS ARE LIMITED BY SPARK GAP LIFETIMES AND NOT THE LASER. POOR SPARK GAP LIFETIMES DEGRADE SYSTEM RELIABILITY AND INCREASE COST.

SOLUTION - IMPROVE MANUFACTURING TECHNIQUES TO INCORPORATE LOW STUTTER ELECTRODES INTO SPARK GAPS. IMPROVE TESTING PROCEDURES DURING MANUFACTURE TO ELIMINATE SPARK GAPS WITH POTENTIALLY POOR LIFETIMES.

1200

MATERIALS & MECHANICS RESEARCH CENTER



<u>CATEGORY</u>	<u>PAGE</u>
General-----	166
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US ARMY MATERIALS AND MECHANICS RESEARCH CENTER
(AMMRC)

The Army Materials and Mechanics Research Center (AMMRC) is designated the DARCOM Lead Laboratory for Materials Testing Technology. In this role, AMMRC is responsible for management and direction of the DARCOM materials testing technology activities and formulation of the Materials Testing Technology (MTT) Program. This program formulation is accomplished by identifying and defining materials testing problem areas in response to system requirements of the DARCOM R&D and Readiness Commands and Project Managers utilizing materials testing technology. The Lead Laboratory mission also encompasses the advising and assisting of the major subordinate commands and Project Managers in the utilization of Materials Testing Technology in order to assure a smooth transition from the developmental to the production phases of the life cycle. Concurrent with the above responsibilities is the furnishing of technical assistance in the application of methods and techniques in solving material problems in connection with procured items.

The MTT Program has shown a steady growth over the last several years, from 2.5 million dollars in FY 73 to 4.5 million dollars in FY 79. This growth has been largely due to the increased participation in the Program by DARCOM Project Managers, as well as increased attention to the Program by DARCOM Quality Assurance managers. Another increasing trend within the MMT Program has also been the directing of more and more testing related projects to the MTT Program. Specific areas of effort are as follows:

a. Automated Testing

One of the primary needs in NDT and in inspection in general is to remove the decision-making from the inspector where possible. In FY 80 and beyond efforts will be intensively directed toward providing engineering prototype systems utilizing automated decision-making. These include automated radiographic and ultrasonic techniques, optical/laser techniques, and computerized chemical analysis. The ultimate goal in all automated testing systems is the essential feedback to the total system for automated process control.

b. Predictive Failure

The need for diagnostic measurement techniques for anticipation of catastrophic failure and for the measurement of remaining life, both in operating equipment and in units being overhauled and rebuilt, presents a tremendous opportunity for cost savings and reliability improvement. A principal thrust has come from the loss of diagnostics and in-situ measurements adjunct to non-destructive testing represents the real time use of NDT techniques with analysis and decision elements built in.

c. Materials

As the newer materials are utilized in major weapon systems, it is imperative that new and/or improved inspection techniques be available to measure characteristics or parameters to assure adequate and reliable performance. Of particular interest in the next five years are composites, elastomers, plastics, and ceramics, with continuing interest in metals and energetics (explosives, pyrotechnics, and propellants).

d. Techniques

Specifically covered in the objectives of the MTT Program is the investigation of specific physical principles which can potentially offer significant improvement in sensitivity, cost, portability, or speed, and combination of these. The development and application of techniques, such as ultrasonics, infrared, holography, spectroscopy, chromatography, etc, can significantly improve DARCOM materiel and offer substantial improvement in process control.

The MTT Program effected a test method categories classification change in FY 1980 to more accurately reflect certain current technology interests. Historically, the Program has always included the testing of electronic materials and materiel under one of three broad test method categories: nondestructive, chemical, or mechanical testing. However, electronic materials and materiel are often used in highly mission-critical applications and they usually employ and reflect advanced and sophisticated technologies, not only in their production but in their quality assurance inspection procedures. It was therefore determined that it would be in the best interest of the overall MTT Program to provide enhanced visibility to this highly relevant subject. Accordingly (starting in FY 1983), a fourth MTT test method category was established; namely, "Electronics".

DARCOM
COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
GENERAL	681	586	850	850	850
TESTING	4102	5000	5000	5500	5500
TOTAL	4783	5580	5850	6350	6350

 * C A T E G O R Y *

 * GENERAL *

MMT FIVE YEAR PLAN
 RCS DRMT 126

	FUNDING (\$000)		
PRIOR	61	62	63
	64	65	

COMPONENT -- MISCELLANEOUS

(5052) TITLE - ARMY ENGINEERING DESIGN HANDBOOK FOR PRODUCTION SUPPORT

PROBLEM - TECHNICAL SCIENTIFIC AND ENGINEERING DATA IS CONTINUALLY BEING GENERATED WITHIN THE ARMY AND NEEDS TO BE COLLECTED IN APPROPRIATE DOCUMENTS.

SOLUTION - INITIATE REVISE AND UPDATE DATA USED IN PRODUCTION OF MILITARY HARDWARE AND EQUIPMENT.

(6390) TITLE - PROGRAM IMPLEMENTATION AND INFORMATION TRANSFER

PROBLEM - THE SUCCESS OF THE MMT PROGRAM IS VERY DEPENDENT ON WHETHER THE RESULTS OF MMT WORK GET IMPLEMENTED. THIS IN TURN IS DEPENDENT ON WHETHER INFORMATION CONCERNING THE MMT TECHNOLOGY IS MADE AVAILABLE AND USED BY CONCERNED PARTIES.

SOLUTION - INSURE THAT THE MMT RESULTS ARE DOCUMENTED AND GIVEN WIDE DISTRIBUTION SO AS TO ENCOURAGE IMPLEMENTATION.

 * C A T E G O R Y *

 * TESTING *

COMPONENT -- CHEMICAL

(6352) TITLE - MATERIALS TESTING TECHNOLOGY (MMT)

PROBLEM - CURRENT LABORATORY METHODS FOR CHEMICAL TESTING ARE SPECIALIZED AND EXPENSIVE. REAL TIME TESTING TECHNIQUES ARE NEEDED TO CONTROL CHEMICAL PROCESSING.

SOLUTION - ADAPT QUICK RESPONSE CHEMICAL TESTING EQUIPMENT TO AUTOMATE THE CONTROL OF CHEMICAL PROCESSES.

COMPONENT -- ELECTRONICS

(6353) TITLE - MATERIALS TESTING TECHNOLOGY (MMT)

PROBLEM - ELECTRONIC ITEMS AND ANCILLARY DEVICES ARE AMONG THE MOST TECHNICALLY SOPHISTICATED AND MISSION-CRITICAL OF THE ARMY INVENTORY. CURRENT TESTING OF THESE ITEMS IS EQUALLY SOPHISTICATED, TIME-CONSUMING, AND DIFFICULT TO ADAPT TO PRODUCTION ENVIRONMENT.

SOLUTION - ADAPT CURRENT AND DEVELOPING STATE-OF-THE-ART TESTING TECHNIQUES TO SIMPLIFIED, RAPID INSPECTION SYSTEMS FOR ON-LINE REAL-TIME PRODUCTION QUALITY ASSURANCE.

MAT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT -- MECHANICAL

	FUNDING (\$000)					
	PRIOR	81	82	83	84	85
(6351) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)	5494	875	1070	975	1000	1000

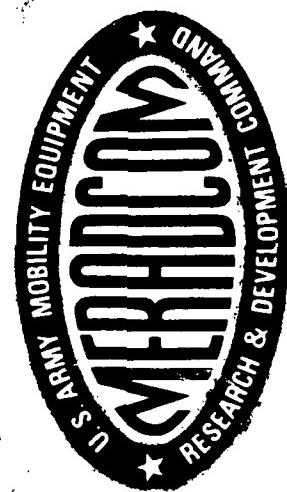
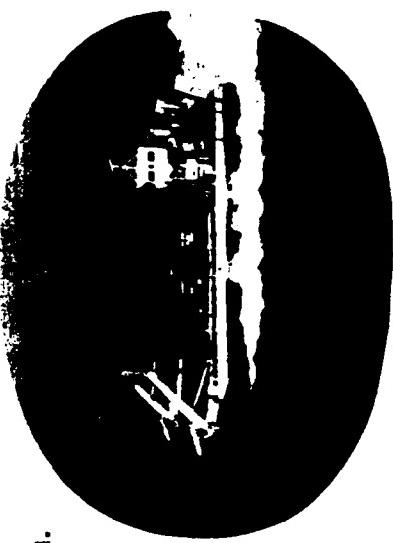
PROBLEM - METHODS OF MECHANICAL TESTING ARE BASICALLY TIME CONSUMING, LABORATORY TYPE OPERATIONS. THIS TESTING IS OFTEN ULTIMATE AND THEREFORE DISTRACTIVE OR IT TENDS TO INTRODUCE RESIDUAL STRESS/STRAIN IN THE TESTED ITEMS.

SOLUTION - ESTABLISH IMPROVED REAL-TIME INSPECTION TECHNIQUES TO REDUCE PRODUCTION BOTTLENECKS ASSOCIATED WITH MECHANICAL TESTING. ALSO, THE OPTIMUM TESTING CRITERIA WILL BE ESTABLISHED WHEN NECESSARY.

COMPONENT -- NON-DESTRUCTIVE TESTING

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

	FUNDING (\$000)					
	PRIOR	81	82	83	84	85
PROBLEM - DESTRUCTIVE AND CERTAIN CONVENTIONAL NON-DESTRUCTIVE TESTING TECHNIQUES ARE RESPECTIVELY UNSUITED AND INADEQUATE OR HARD TO BE ADAPTED TO ON-LINE PRODUCTION TESTING USAGE.	14480	2313	2820	2600	2900	2900
SOLUTION - DETERMINE FEASIBILITY OF ADAPTING LAB-PROVEN NOT METHODS OR MODIFIED THE EXISTING TEST PROCEDURES FOR ON-LINE PRODUCTION QUALITY ASSURANCE TESTING.						



Fort Belvoir, Va.

<u>CATEGORY</u>	<u>PAGE</u>
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US ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND
(MERADCOM)

MERADCOM, located at Fort Belvoir, VA, conducts a widely diversified program to improve the Army's combat readiness in four major areas: barrier and counterbarrier systems; countersurveillance systems; energy and environmental systems; and supply distribution and construction equipment systems.

Procurements for items under MERADCOM's cognizance are placed with the private sector, and much of MERADCOM's MMT effort is accomplished by the private sector.

To address the problem of increased system acquisition costs, MERADCOM has identified major problem areas where improved manufacturing technology is needed. Major problem areas confronting MERADCOM include:

a. Limitations of High Temperature Super Alloy Components of Gas Turbine Engines. A limiting factor in the life and performance of gas turbines is the ability of the components to withstand the abrasive and corrosive environment at peak operating temperatures. Super alloy metals utilizing strategic materials are limited to 1750°F operating temperature and are subject to catastrophic failure when subjected to high dust concentrations or corrosive atmosphere such as salt. Thermal efficiency can be improved by increasing peak cycle temperature currently limited by maximum operating temperature of materials of the burner, turbine inlet nozzle, and turbine wheel. The most critical component for damage due to wear and corrosion is the turbine nozzle. Materials are needed which have increased operating temperature limits and improved resistance to corrosion and abrasive wear at a reasonable cost.

b. Providing Military Bridges at Moderate Cost, Which Have High Mobility and High Emplacement Speeds While Retaining The Ability to Withstand the Abusive Treatment Inherent in the Battlefield Environment. High strength, low density composite materials in both organic and/or metallic matrix appear to offer great promise for solutions to this problem. Increased production of high strength fiber materials has reduced materials cost. Techniques for the fabrication and installation of these materials into usable bridge components is the area in which large cost reductions are possible. The reduction of presently used labor intensive methods, through the application of automated processes, will reduce component costs. Initial design in these materials offer improved performance due to the flexibility possible in material configuration.

MERAI COM
C O M M A N D F U N D I N G S U M M A R Y
 (THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
TRIDING	563	0	1800	100	400
FIELD FORTIFICATIONS	170	0	0	0	0
GENERAL	224	0	350	350	300
LAND MINES	0	964	808	948	0
POWER SOURCES	422	0	977	577	114
TOTAL	1379	964	3935	2175	814

MWT FIVE YEAR PLAN		FUNDING (\$000)
CATE GRY	DRPT	
BRIDGE		
COMPONENT -- PTFINFORCEMENT		
(3745) TITLE - ALUMINUM SKIN-CRAPHITE/EPOXY SANWICH BRIDGE REINF		454
PROBLEM - FORMULATION OF PROCEDURES TO MASS PRODUCE ALUMINUM SKIN-CRAPHITE/EPOXY SANWICH MATERIAL FOR PRICER STRUCTURAL MEMBERS.		
SOLUTION - SANWICH ALUMINUM SKIN-CRAPHITE EPOXY ALUMINUM SKIN LAMINATE SHOWS PROMISE OF BEING A STRUCTURE THAT WOULD SATISFY OUR NEEDS IF IT CAN BE ECONOMICALLY MASS-PRODUCED USING ROOM CURING ADHESIVES.		
(3749) TITLE - KEVLAR CABLE REINFORCEMENT FOR MILITARY BRIDGES	109	400
PROBLEM - TO PROVIDE LIGHT WEIGHT REINFORCEMENT TENSION MEMBER HAVING HIGH TENSILE PROPERTIES AND MODULUS.		
SOLUTION - DETERMINE IF KEVLAR MATERIAL CAN BE PRODUCED ON A PRODUCTION BASIS AND MAINTAIN THE HIGH PHYSICAL PROPERTIES REQUIRED IN A REINFORCING MEMBER.		
COMPONENT -- STRUCTURAL MEMBERS		
(3746) TITLE - METAL MATRIX COMPOSITE MATERIAL		
PROBLEM - CONNECTIONS OF COMPOSITE MATERIAL IS DIFFICULT IN LINEAR PLANAR COMPONENTS. MECHANICAL CONNECTIONS ARE EXPENSIVE IN BOTH DESIGN AND MATERIAL.		
SOLUTION - IMPED HIGH MODULUS FIBER MATERIAL IN DUCTILE METAL WHICH CAN BE WORKED AND CONNECTED WITH STANDARD METHODS.		
(3747) TITLE - LIMPLE PLATE WEB FOR BRIDGES		400
PROBLEM - HOW TO STABILIZE THIN SHEETS OF ALUMINUM TO CARRY HIGH SHEAR STRESSES WITHOUT RUCKLING.		
SOLUTION - CONTROLLED SPACING OF LEAN CLEMPLES OF PLATES AND SPOTWELD TWO PLATES TOGETHER AT ECTOM OF CLEMPLES TO FORM A SANDWICH PLATE.		
(3748) TITLE - MULTI HOLLOW SHEAR WEB MODULE		700
PROBLEM - TO PROVIDE A LIGHT WEIGHT SINGLE PIECE WEB MEMBER WHICH CAN BE EASILY ATTACHED TO TOP AND BOTTOM CHORD MEMBERS.		
SOLUTION - WIND THE WEB MODULE ON A LARGE INFLATED CYLINDRICAL MANDREL USING GRAPHITE EPOXY. AFTER WINDING IN UNCURED STATE DEFlate MANDREL AND FORCE WOUND MEMBER INTO MOLD HAVING RESTRIE WEB SHAPE AND CURE.		

* CATE GRY		
* FIELD CERTIFICATIONS		

CONVENTIONAL	TITLE	DESCRIPTION	FUNDING (\$000)			
			PRIOR	F1	82	83
(5.53)	TITLE - DIGITAL ELEVATION DATA EQUIPMENT FACILITY	PROBLEM - TECHNOLOGY EXISTS TO TRANSFER FORMATTER DIGITAL ELEVATION DATA (FOR VESSES) FROM 5-TRACK COMMERCIAL TAPES TO CASSETTES COFATIBLE WITH THE FIFEFINDER SYSTEM. HOWEVER THIS TECH HAS NOT BEEN INTEGRATED INTO VAN-MOUNTED PORTABLE FIELD FACILITIES.	170			
		SOLUTION - A PROTOTYPE VAN-MOUNTED DIGITAL ELEVATION DATA DURING FACILITY CAPABLE OF EXTRACTING DATA FROM THE DMA 5-TRACK TAPE AND TRANSFERRING IT TO THE FIFEFINDER CASSETTES WILL BE FABRICATED.				
*****	*****	*****				
* C & T (F G R Y	* GENERAL	*****				
*****	*****	*****				
CONVENTIONAL	MISCELLANEOUS					
(5.7.1)	TITLE - CONTINUOUS LENGTH FUEL HOSE	PROBLEM - PRESENT FUEL RESISTANT CONTINUOUS LENGTH HOSE IS MANDREL FABRICATION. FIFTY OR A HUNDRED FEET LENGTH OF HOSE IS FIRST MANDREL MADE 2IN. THEN SECTIONS ARE SPLICED TOGETHER FOR THE DESIRED LENGTH. SPLICING IS A LARGER INITIATIVE.	424	69		
		SOLUTION - EXTRUDED LENGTHS OF HOSE WITHOUT SPLICES. FIRE HOSE IS PRODUCED BY THIS METHOD WHICH IS ALSO APPLICABLE TO FUEL HOSE. NON-SPLICED, EXTRUDED, CONTINUOUS HOSE WILL BE MORE RELIABLE AND LESS EXPENSIVE THAN PRESENT SPLICED HOSE.				
(5.7.2)	TITLE - OPERATING PRODUCTION METHODS AIR CYCLE CIRCULATOR	PROBLEM - TECHNICAL INNOVATION HAS PROCEDED AN AMP CYCLE COMPRESSOR-EXPANDER. THE FABRICATION TECHNIQUES AND MATERIALS OF CONSTRUCTION USER TO PRODUCE PROOF OF CONCEPT HARDWARE WILL BE UNECONOMICAL FOR FULL SCALE PRODUCTION.	350	350	350	350
		SOLUTION - DEVELOP NEW MANUFACTURING METHODS TO MACHINE ELLIPTICAL CAM TRACKS INTO PLATES OF COMPRESSOR-EXPANDER.				
(5.7.3)	TITLE - LACV-3G, SKIRT AND FINGER CONCENTS					
		PROBLEM - FABRICATION OF SKIRT, FINGERS, AND CONCENT IS CURRENTLY HIGHLY LABOR INTENSIVE. LEADING TO HIGH COMPONENT REPLACEMENT COSTS.	191	135		
		SOLUTION - DEVELOP SPECIALIZED AUTOMATIC FABRICATION TECHNIQUES TO REDUCE MANUFACTURING COSTS.				

 * C A T E G O R Y *

 * LAND MINES *

 COMPONENT -- NEUTRALIZERS

 PMT FIVE YEAR PLAN
 RCS DRAFT 126

FUNDING (\$000)

	P1	P2	P3	P4	P5
PRIOR					

(37-6) TITLE - COMBAT VEHICLE DEGAUSSING

PROBLEM - PRESENT DESIGN AND FABRICATION TECHNIQUES FOR VEHICLES RESULT IN A SIGNIFICANT MAGNETIC SIGNATURE. THIS MAGNETIC SIGNATURE CAN BE USED TO FUZE LAND MINES TO ATTACK THE VEHICLE UNERCARRIAGE.

SOLUTION - CONSTRUCT A PILOT DEGaussING SYSTEM THAT WILL ALLOW DEVELOPMENT OF A DEGAUSSING TECHNIQUE FOR JS ARMORED VEHICLES.

 * C A T E G O R Y *

 *POWER SURFACES *

 COMPONENT -- MISCELLANEOUS

(3532) TITLE - MOLTEN SALT Li/CL BATTERY

PROBLEM - PRESENT LEAD/ACID AND NICKEL/IRON BATTERIES OFTEN NEED RECHARGING IN ORDER TO COMPLETE AN EIGHT HOUR SHIFT.

SOLUTION - ESTABLISH METHODS FOR PRODUCING IN QUANTITY LITHIUM CHLORIDE MOLTEN SALT BATTERIES.

(3772) TITLE - INTEGRATED POWER SWITCH

PROBLEM - THE HIGH POWER SWITCHING CAPABILITY REQUIRES IMPROVED COOLING OF THE POWER STAGE. THIS REQUIRES MECHANICAL AND ELECTRICAL CONSIDERATIONS.

SOLUTION - METHODS MUST BE DEVELOPED TO PRODUCE AND ATTACH HEAT PIPES FOR COOLING DURING QUANTITY PRODUCTION. RELATED ELECTRICAL AND MECHANICAL CHANGES MUST ALSO BE DEVELOPED FOR QUANTITY PRODUCTION.

(3765) TITLE - SENSING AND CONTROL MODULE

PROBLEM - TRANSFORMERLESS INVERTERS UTILIZE MANY DISCRETE SEMICONDUCTORS INTERCONNECTED TO INTEGRATE CIRCUITS IN LIEU OF TRANSFORMERS BUT RESULTING HEAT DISSIPATION REQUIRES A BULKY PACKAGE WITH REDUCED RELIABILITY.

SOLUTION - DEVELOP MANUFACTURING PROCESS FOR MODULES INCORPORATING INTEGRATED CIRCUITS AND OTHER ELECTRONIC COMPONENTS WITH A LARGE SCALE INTEGRATED CIRCUIT REPLACING DISCRETE DEVICES. MODULES ARE TO INCLUDE SATISFACTORY COOLING DEVICE SUCH AS A HEAT PIPE.

MMI FIVE YEAR PLAN
RCS CRCMT 126

COMPONENT -- TURBINES

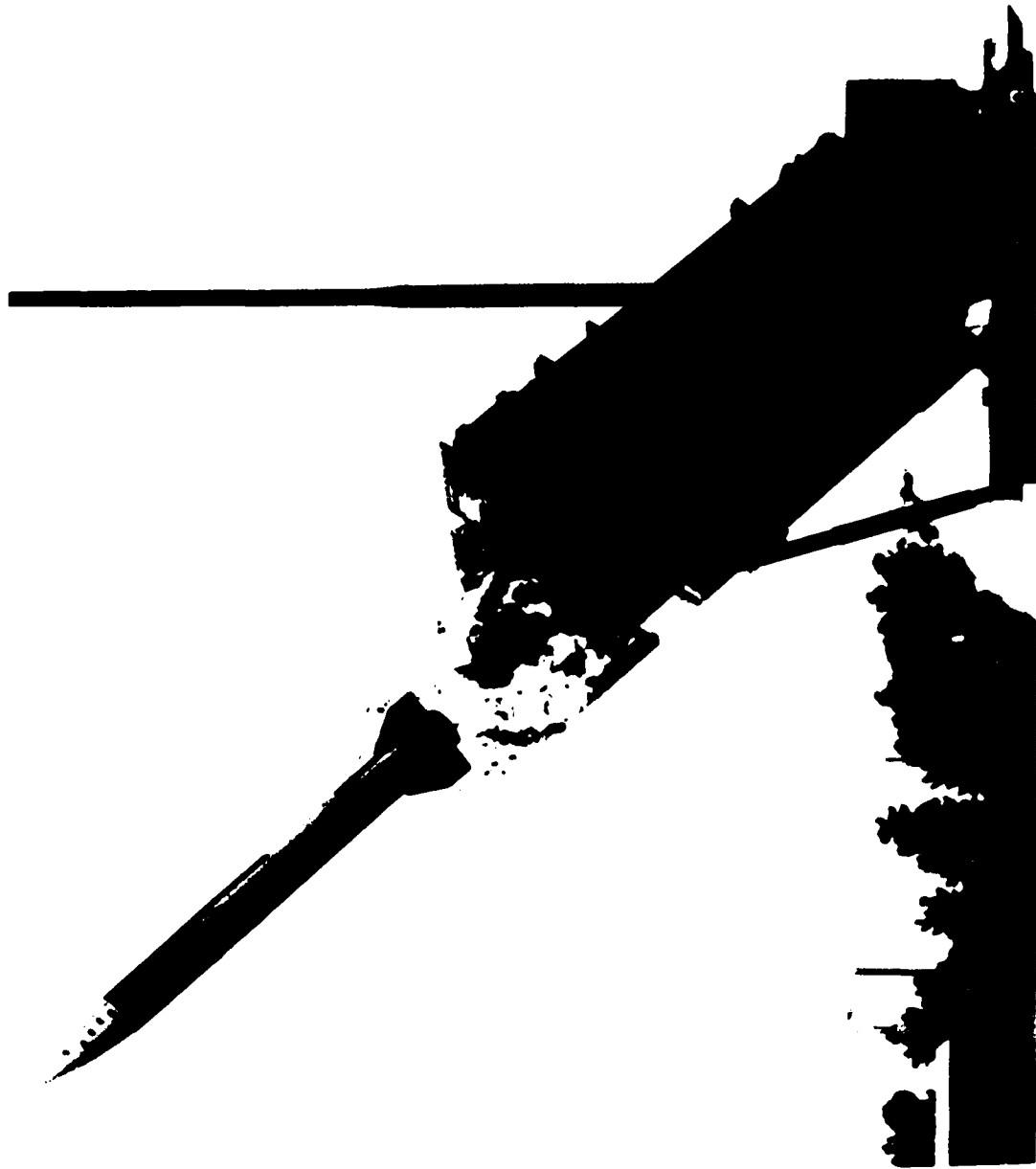
(3717) TITLE - HIGH TEMPERATURE NOZZLE FOR 10KW POWER UNIT

PROBLEM - SUPER ALLOY METALS USED IN HOT COMPONENTS OF GAS TURBINES ARE LIMITED IN OPERATING TEMPERATURE AND ARE SUBJECT TO PREMATURE FAILURE IN DUSTY OR CORROSIVE ATMOSPHERE. ALLCY METALS ARE STRATEGIC MATERIALS AND ARE COSTLY TO MANUFACTURE.

SOLUTION - DETERMINE METHODS AND TECHNIQUES TO REDUCE THE COST OF MANUFACTURING HIGH TEMPERATURE CERAMIC MATERIALS WHICH HAVE BEEN FOUND TO POSSESS HIGH TEMPERATURE RESISTANCE TO DUST ABRASION AND SALT CORROSION. MATERIALS WILL CONTAIN NO STRATEGIC ELEMENTS.

FUNDING (\$000's)

PRIOR	81	82	83	84	85
775	422				



MISSILE COMMAND
(Micom)

<u>CATEGORY</u>	<u>PAGE</u>
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US ARMY MISSILE COMMAND
(MICOM)

The US Army Missile Command is located at Redstone Arsenal, AL, and is responsible for research, development, and acquisition of missile systems for the Army. Facilities include flight test ranges, laboratories, and a simulation center.

Major systems managed by special project offices include STINGER (Shoulder-Fired Air Defense Guided Missile), US ROLAND (All-Weather Air Defense Missile System), MLRS (Multiple Launched Rocket System), Viper (Short-Range Anti-Tank Weapon), HELLFIRE (Helicopter-Carried Air-To-Ground Missile), PERSHING (400-Mile Range Air-To-Ground Missile) and the 2.75 Inch Air-To-Ground Rocket. MICOM is also the Army's center for laser research and manages efforts to apply lasers in missile guidance and as weapons.

MICOM supports technological thrusts in the following electronics areas: (1) Manufacturing techniques for multiple chips employing multiple technologies that are projected to be in the mainstream of the semiconductor marketplace for many years to come. (2) Electronic computer-aided manufacturing and hybrid computer-aided design and manufacturing in order to automate microelectronic production lines and therefore improve productivity, increase fabrication speed and decrease unit cost. (3) Elimination of precious metals from military hybrid micro-circuits and their replacement with materials which are universally available and economically attractive.

A major thrust in MICOM's MMT Program is guidance systems. A large amount of this effort is planned for work on gyros, printed circuits, and seekers. Improvements in the gyro can be made by addressing proposals in new machining methods and assembly techniques. Efforts in the electronics area include projects on plated-through holes, thin foils, wave soldering, and cleanliness criteria. The seeker area includes work on infrared optics, radio frequency, and laser optics. Other work planned on guidance systems include projects for windows and radomes, optics, and hybrid circuits.

Another thrust area is missile structures, which includes projects for airframes using metal, plastic, or composites. Efforts for composite airframes will address filament winding, inner shell forming and missile substructures. New joining, machining, and forming technologies will be investigated and applied.

Proposals in the area of test equipment include work on electrical, x-ray, neutron and hydraulic equipment. Calibration efforts include infrared testing of PC boards, digital fault isolation, and automatic circuit tuning.

MICOM
COMMAND FUNDING SUMMARY
 (THOUSANDS)

CATEGORY	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
CONTAINERS/LAUNCHERS	350	0	0	338	300
CONTROL SYSTEM	2200	2023	5000	12350	12500
GENERAL	0	0	1450	1250	1250
GROUND SUPPORT EQUIPMENT	375	0	1630	2000	925
GUIDANCE SYSTEM	7705	4399	12613	10604	7100
MISSILE STRUCTURE	794	241	1450	1890	2575
PROPELLION SYSTEM	3954	4561	3380	1575	2075
TEST EQUIPMENT	2586	1732	2032	1440	1490
TOTAL	17464	12956	27555	31647	26215

 * C A T I C G R Y
 * *****
 * C O N T A I N E R S / L A U N C H E R S
 * *****

COMPONENT -- LAUNCHERS

(167) TITLE - LOW COST SMALL ROCKET CONVENTER/LAUNCHER PROD

PROBLEM - CURRENT LAUNCH PODS ARE EXPENSIVE AND REQUIRE RLUSE IN ORDER TO MAINTAIN COST PER ROUNG AT AN ACCEPTABLE LEVEL.

SOLUTION - LOW COST PLASTICS WILL BE APPLIED TO THE STRUCTURE. COMMERCIAL GRADE PLASTICS SUCH AS ABS, PVC, AND FOAMS IN INCLDED AND FORCED SHAPES WILL BE CONSIDERED. LONG TERM SERVICE ENVIRONMENT WILL BE EVALUATED BY ACCELERATED AGING AND CREEP TESTING.

(168) TITLE - PAINT CURE FOAM-IN-PLACE

PROBLEM - PRODUCTION PROCESSES FOR FOAM-IN-PLACE MATERIALS ARE NOT CONDUCTIVE FOR HIGH RATE PRODUCTION OF LARGE STRUCTURES. PROBLEMS INCLUDE NON-UNIFORM RESISTIVITY, SLOW FOAMING, AND VOLTS IN CONSTRUCTED PARTS.

SOLUTION - IMPROVE MFG METHODS REQUIRED TO FABRICATE LARGE, COMPLEX STRUCTURES. THIS WILL INCLUDE OPTIMIZATION OF FOAM PLACEMENT METHODS, TOOLING CONCEPTS, AND MATERIALS SYSTEMS TO SUPPORT HIGH RATE, LOW COST PRODUCTION.

 * C A T E C O R Y
 * *****
 * C O N T R O L S Y S T E M
 * *****

COMPONENT -- CIRCUITRY

(169) TITLE - SEMIADDITIVE REEL TO REEL FLEX PRINT PROCESS

PROBLEM - CONVENTIONAL BATCH PROCESSING OF PRINTED WIRING BOARDS IS LABOR INTENSIVE. HAND LABOR IS BOTH COSTLY AND SUBJECT TO ERRORS WHICH ACCS REJECT LOSES TO LABOR COSTS.

SOLUTION - A REEL TO REEL MFG PROCESS FOR PCB'S WILL PRODUCE COMPLETE PCB'S FROM REELS OF CLAD STOCK IN A SIGNIFICANT SET OF OPERATIONS. THE OUTPUT CIRCUITS WILL BE FLAT CARB OR FLEXIBLE CIRCUITY.

(170) TITLE - HYBRID INTEGRATED CAD AND MANUFACTURING (ICAM)

PROBLEM - HYBRID CIRCUIT DESIGN AND MANUFACTURE IS LABOR INTENSIVE. THE CAD DATA BASE HAS NOT BEEN EXTENDED TO MANUFACTURING PROCESS CONTROL.

SOLUTION - ANALYZE FUNCTIONAL FLCK AND MANUFACTURING PROCESS CONTROLS AND MODIFY THE DESIGN DATA BASE TO MAKE IT CAPABLE OF REFINING FUNCTIONS, INPUT, OUTPUT, CONTROLS AND INTERFACES. USE ICAM METHODOLOGY TO DEVELOP SYSTEM ARCHITECTURE.

 * P R O J E C T
 * F I V E Y E A R P L A N
 * R C S D R C M T 126
 * *****

FUNDING (\$000)

	PRIOR	b1	b2	b3	b4	b5
		336	306			

MAT FIVE YEAR PLAN
RCS DRCPY 126

FUNDING (\$000)

PP10K P1 P2 P3 P4 P5

(CONTINUED)

1. ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM)

PROBLEM - ALTHOUGH PRINTED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS AND CIRCUITS ON A COMPUTER. THERE IS LITTLE COMPUTERIZED CONTROL OF CIRCUITS TO PRODUCE THESE ITEMS. A MASTER PLAN IS NEEDED TO DEFINE THE REQUIREMENTS.

SOLUTION - DEVELOP A ROD MASTER PLAN FOR COMPUTER-AIDED DESIGN AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE'S ICAP AND NASA'S IPAD PROGRAMS TO DEFINE NEW AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUITS, HYBRID PRINTED CIRCUITS, AND CABLES.

2. USE OF PRECIOUS METALS MICROCIRCUIT APPLICATIONS

PROBLEM - ELIMINATE USE OF NOBLE OR PRECIOUS METALS BY ESTABLISHING A THICK SILVER PASTE USING BASE METAL AS A COFFEE OR NICKEL IN THE FABRICATION PROCESS, MICROCIRCUIT PACKAGES.

SOLUTION - USE NON-NOBLE METALS ELIMINATING THE REQUIREMENTS FOR GOLD. APPLICATION OF NON-NON-NOBLE METALS WOULD BE ESTABLISHED BY DETAILED ANALYSIS OF MATERIAL COMPATIBILITY.

3. WIRE HARNESS ASSEMBLY SYSTEM

PROBLEM - WIRE HARNESS FABRICATION IS A LABOR INTENSIVE PROCESS. APPROXIMATELY 50% OF HARNESS FABRICATION TIME IS DEVOTED TO HANDLING, SIGHTING, AND IDENTIFICATION. HARNESS ASSEMBLY IS DONE BY HAND. PROCEDURES USE SEVERAL WORKSTATIONS AND REPEATED HANDLING.

SOLUTION - A COMPUTER CONTROLLED MANIPULATOR (ROBOT) WITH SIX DEGREES OF FREEDOM INCORPORATES WIRE PREPARATION, HARNESS ASSEMBLY, AND TESTING INTO A SINGLE WORKSTATION. AN INTEGRATED SYSTEMS APPROACH WILL INCORPORATE STATE-OF-THE-ART EQUIPMENT AND TECHNIQUES.

4. MISSILE/ROCKET DISPENSING SYSTEM

PROBLEM - DISPENSING UNITS ARE FABRICATED, ASSEMBLED, AND TESTED BY HAND.

SOLUTION - ESTABLISH AUTOMATED AND SEMI-AUTOMATED SYSTEM FOR PRODUCING THE DISPENSING DEVICE

• CATEGORY •
• STEVAL •

350 500

PART FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$000)

COMPONENT -- MISCELLANEOUS

(11085) TITLE - ELIMINATE GOLD ON SWITCH CONTACTS.

PROBLEM - ELIMINATE THE USE OF GOLD ON COMMERCIAL AND MILITARY HIGH RELIABILITY SWITCH CONTACTS.

SOLUTION - ESTABLISH A LESS EXPENSIVE METAL OR ALLOY IN PLATING CONTACTS.

(11102) TITLE - LITHOGRAPH FOR MICROCIRCUIT CHIPS

PROBLEM - CURRENT METHODOLOGY FOR THE GENERATION OF PHOTO LITHOGRAPHY EQUIPMENT IS APPROACHING THE DIFFRACTION LIMIT OF LIGHT. THIS CONDITION RESULTS IN POOR PATTERN REPLICATION AND INCREASE IN DEFECTS.

SOLUTION - ESTABLISH AN X-RAY LITHOGRAPHY PROCESS WHERE REPRODUCTION OF PATTERNS UP TO 1 CM SQUARE ARE ACCURATE.

* C A T E G O R Y

* GROUND SUPPORT EQUIPMENT

183

COMPONENT -- CIRCUITRY

(11156) TITLE - MILLIMETER WAVE OSCILLATORS FOR MONOPULSE RECEIVERS

PROBLEM - DEVELOPMENT OF A 140 GHZ GUIDANCE SYSTEM IS HAMPERED BY HIGH COST AND LOW EFFICIENCY OF THE MACHINED WAVEGUIDE VARACTOR MULTIPLIERS. GUNN OSCILLATORS, THF ONLY FRACITONAL ONE FOR INPUT, HAS BORDERLINE POWER LEVELS.

SOLUTION - USE THE SEMI-ADITIVE MMF MFG PROCESS TO ELECTROPLATE SILVER ON LOW LOSS SUBSTRATES TO FORM 1) A LOW FREQUENCY INPUT BAND PASS FILTER MATCHING THE GUNN, 2) A NON LINEAR VARACTOR ELEMENT, AND 3) A HIGH FREQUENCY OUTPUT BAND PASS AT 140 GIGAHERTZ.

(11065) TITLE - FROD OF QUIET RADAR SIGNAL PROCESSORS USING VLSI TECHNOLOGY

PROBLEM - THE MAN TECH BASE TO FRCUCE RADAR SIGNAL PROCESSORS USING VHSI (VERY HIGH SPEED INTEGRATED CIRCUITS) DOES NOT EXIST. METHODS USING LSI (LARGE SCALE INTEGRATED) CHIPS ARE INADEQUATE. HOWEVER, SOME TECHNIQUES MAY BE TRANSLATABLE TO VLSI.

SOLUTION - THIS PROJECT WILL USE FOUR CHIPS DEVELOPED UNDER ANOTHER MMF PROGRAM TO ESTABLISH MANUFACTURING METHODS FOR THE QUIET RADAR SIGNAL PROCESSOR. PROJECT WILL REDUCE CCST AND IMPROVE RELIABILITY AND MAINTAINABILITY.

PRIOR 81 82 83 84 85

FUNDING (\$000)
260
1250 1250 1250

PHI FIVE YEAR PLAN
R&D GRANT 126

COMPONENT	TITLE	PROBLEMS	SOLUTION	FUNDING (\$000)			
				PRIOR	R1	R2	R3
CONTINUE(1)							
111.5) CIRCUITRY	PRODUCTION METHODS FOR A LOW SIGHTLESS ANTENNA NETWORK	PROBLEM - CURRENT MANUFACTURE OF AIR STIFFLING NETWORKS FOR LOW SIDEFIRE ANTENNA ARE EXPENSIVE BECAUSE OF LARGE BOARD SIZE WITH ACCURATE DIMENSIONAL TOLERANCE REQUIREMENTS.	SOLUTION - ESTABLISH METACOLOGY REDUCING THE LINE LENGTH TRIMMING. AUTOMATE PLACEMENT AND SPLICING OF INSULATED RESISTORS AND THE PLACEMENT OF GROUND PLANE LAGGERS REDUCING HAND LABOR.	260	500		
13214) CIRCUITRY	INJECTION MOLDING ELECT. CONNECTORS + CABLES			400			
CONTINUE(2)							
13376) CIRCUITRY	STRAIN RELIEF FOILING AND WELDING, AND ENVIRONMENTAL SEALING OF ELECTRICAL CABLE AND OF CONTACT ASSEMBLIES IS COSTLY.	PROBLEM - STRAIN RELIEF FOILING AND WELDING, AND ENVIRONMENTAL SEALING OF ELECTRICAL CABLE AND OF CONTACT ASSEMBLIES IS COSTLY.	SOLUTION - THE CABLES WILL BE INJECTION MOLED IN A 4 STEP PROGRAM. INJECTION MOLEDING WITH A COST ANALYSIS WILL BE MADE. DESIGN, FAB & MOLDING GUIDELINES WILL BE DEFINED. QUALIFICATION METHODS WILL BE DEFINED. CURRENT HARDWARE WILL BE PROCESSED AND VALIDATED.	675	375		
13377) CIRCUITRY	TESTING ELECTRO-OPTICAL COMPONENTS AND SUBSYSTEMS	PROBLEM - MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION OF ELECTRO-OPTICAL SYSTEMS IS VERY LIMITED. LITTLE CORRELATION EXISTS BETWEEN COMPONENT SPECIFICATIONS AND THE PARAMETERS THAT IMPACT SYSTEM PERFORMANCE.	SOLUTION - ECONOMY OF PRODUCTION, TESTING METHODS, OR TECHNIQUES COULD BE DEVELOPED BY VALIDATING EXISTING SPECIFICATIONS OR REPLACING EXISTING ONES WITH SPECIFICATIONS THAT ARE BASED ON SYSTEM PERFORMANCE RATHER THAN COMPONENT PERFORMANCE.	200	175		
CONTINUE(3)							
13437) CIRCUITRY	MANUFACTURING COST ANALYSIS (CAM)	PROBLEM - THERE IS A NEED TO DEFINE AND CONTROL ACQUISITION PROGRAM COST DURING CONTRACT DEFINITION AND DEVELOPMENT PHASES.	SOLUTION - STRUCTURE COMPUTER MODEL TO CALCULATE THE LABOR CONTENT OF A DESIGN CONCEPT IN STANDARD SETUP AND RUN TIME.	250	250		
13437) CIRCUITRY	RECOVERY/RECYCLING OF HEAVY METAL FROM SEWAGE PROCESSING SOLS	PROBLEM - THE PRESENT PRACTICE FOR THE DISPOSAL OF WASTE PRECIOUS METAL MATERIALS IS TREATMENT IN A CONVENTIONAL WASTE TREATMENT PLANT.	SOLUTION - DEVELOP ONE OR MORE SYSTEMS AND PROCESSES THAT WILL RECOVER THESE PRESENTLY DISCARDED MATERIALS IN A SALVAGEABLE RE-USABLE FORM.				

 * C A T E G O R Y *

 * GUIDANCE SYSTEM *

 COMPONENT -- BATTERIES

(328c) TITLE - ENG. ANAL. OF MFG PARAMETERS FOR THERMAL BATTERIES

PROBLEM - SLIGHT VARIATIONS IN MANUFACTURING PARAMETERS HAVE A GREATLY MAGNIFIED EFFECT ON FINAL BATTERY PERFORMANCE AND AS A RESULT REJECTION RATES ARE HIGH.

SOLUTION - OPTIMIZE EACH FACET OF MANUFACTURING TECHNIQUES BY STATISTICALLY CORRELATING VARIED PARAMETERS.

(328f1) TITLE - SILVER ZINC GUIDANCE BATTERIES (CAM)

PROBLEM - ANODE AND CATHODE MANUFACTURING FOR SILVER ZINC BATTERIES IS BASED ON TWENTY YEAR OLD TECHNIQUES. REQUIREMENTS CALL FOR IN LINE PRODUCTION AND ACCEPTANCE TESTS.

SOLUTION - DEVELOP A COMPUTER AIDED MANUFACTURING PROCESS FOR SILVER-ZINC BATTERIES WITH CONTROLLING SENSORS FOR ACCURATELY MEASURING MATERIALS AND ELECTROCHEMICAL COMPOSITION.

COMPONENT -- GENERAL

(111d) TITLE - SINGLE CRYSTAL SILICON FOR VLSI

PROBLEM - SINGLE CRYSTAL SILICON PROCESSES AND MATERIALS ARE CURRENTLY PROPRIETARY.

SOLUTION - ESTABLISH A PROCESS GRADING 2-INCH DIAMETER SINGLE CRYSTALS.

COMPONENT -- HYBRIDS

(115e) TITLE - ELECTRICAL VERIFICATION AND BURN-IN FOR IN-PROCESS HYBR CHIP

PROBLEM - INSTALLATION OF BAD CHIPS IN HYBRID CIRCUITS IS A CONTINUING PROBLEM. CHIPS ARE TESTED BY PROBE CHECKING. AND WHEN POSSIBLE ARE REMOVED AND REFRACTED. ACCEPTANCE PROCEDURES MUST INCLUDE A LOT ACCEPTANCE PROCEDURE IN ADDITION TO PROBE & VISUAL INSPE.

SOLUTION - MODIFY TAPE LEAD CARRIER TO PREVENT INSTALLATION OF BAD CHIPS IN HYBRID CIRCUITS. DEVELOP THE PROCESS TO PROBE CHECK A CHIP AND TO REMOVE IT FROM HYBRID CIRCUIT PRODUCTION IF CHIP IS BAD. ADAPT PROCEDURES TO TEST EQUIPMENT AND BURN-IN EQUIPMENT.

(116) TITLE - ADDITIVE SINGLE AND MULTILAYER HYBRID CIRCUITRY

PROBLEM - THICK FILM CIRCUITRY USES THE SCREEN AND FIRE PROCESS ON CERAMIC SUBSTRATES. A SEMIADDITIVE FIN-LINE PROCESS, ELECTROLESS COPPER PLATING, USED ON FIBERGLASS AND CERAMIC SUBSTRATES WILL PROVIDE BETTER FIN-LINE AND A COST REDUCTION.

SOLUTION - LAMINATE SURFACE CONDITIONS AND ELECTROLESS COPPER CATALYST STRENGTHS WILL BE INVESTIGATED. VARIATIONS IN PROCESSING PARAMETERS WILL BE EVALUATED. SOFTWARE TECHNIQUES FOR AUTOMATION OF MANUFACTURING PROCESSES WILL BE DEVELOPED.

FUNDING (\$000)

Prior	E1	E2	E3	E4	E5
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145 340

250 250

750 750

250

250

1971 FIVE YEAR PLAN
ECS DRAFT 126

COMPONENT	TITLE	PROBLEMS	SOLUTION	FUNDING (\$000)				
				PRIOR	'81	'82	'83	'84
(CONTINUED)								
(313) COMPONENT	AUTOMATIC SEALING OF HYBRIDS	PROBLEM - HYBRID CIRCUIT ASSEMBLIES FOR MILITARY USE REQUIRE HERMATIC SEALING WHICH IS ACCOMPLISHED BY SOLDERING OR WELDING. BOTH TECHNIQUES REQUIRE AN OPERATOR INVOLVING LABOR INTENSIVE HANDLING AND SET UP ERRORS.	SOLUTION - ESTABLISH AN AUTOMATIC HERMATIC SEALING SYSTEM USING A COMPUTER OR MICROPROCESSOR BASED AND BY MODIFYING EXISTING HERMATIC SEALING EQUIPMENT.	250				
(314) COMPONENT	FILM HYBRID CIRCUITS AND PRESENTLY MANUFACTURED IN A LABORATORY AT A COST APPROXIMATELY ONLY A FEW PRODUCTS.	PROBLEM - CONVERT LABORATORY TECHNIQUES INTO PRODUCTION METHODS UTILIZING AUTOMATED COMMERCIAL EQUIPMENT.	SOLUTION - PRODUCTION TOOLING TECHNIQUES FOR MOLECULAR ELECTRONICS.	650				
(315) COMPONENT	HYBRID PACKAGING MAKES ASSEMBLY VERY COSTLY.	PROBLEM - THERE ARE NO FABRICATION TECHNIQUES FOR PLACING LEADLESS INTEGRATED DEVICES (LIDS) AND COMPONENT CHIPS DIRECTLY ONTO PRINTED CIRCUIT BOARDS.	SOLUTION - DESIGN CRITERIA AND CONSTANT SELECTION AFFECT THE TOTAL HYBRID FABRICATION CYCLE TO AN EXTENT THAT CONSTANT MACHINE OPERATOR ATTENTION IS REQUIRED.	400				
(316) COMPONENT	LID COST HYBRID MICROELECTRONIC CIRCUITS	PROBLEM - DEFINING FINITE PROBLEMS TO ALLOW MORE ECONOMICAL METHODS FOR MACHINE OPERATIONS.	SOLUTION - DETERMINING THE COST DRIVERS OF HYBRID CIRCUIT FABRICATION AND TEST.	186				
COUPON								
(317) COMPONENT	INTEGRATED ELECTRONICS	PROBLEM - AUTO TEST, MOUNTING + STACKING OF LOCASERT UNAXIAL DEVICES	SOLUTION - PROVIDING A SYSTEM THAT WILL AUTOMATICALLY REJECT DEVICE ORIENTATION POSITION THE DEVICE + TRANSFER THE DEVICE INTO THE LOCASERT. ELECTRICALLY TEST THE DEVICE AND COUNT THE DEVICE TEST TICKS FOR THE INSERTION MACHINE.	230				

WPI FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$000)

COMPONENT -- INTEGRATED ELECTRONICS

(CONTINUE¹)

(1031) TITLE - HIGH SPEED PLATING OF CARB FETE CONTACTS.

PROBLEM - MASKING OF THE CONNECTOR IS AN EXPENSIVE PROCESS AND REQUIRES A CLEANING PROCESS TO REMOVE THE RESIDUE FROM THE TAPE. THE ADJACENT PLATING JUNCTION OF DISSIMILAR METALS REQUIRES STRICT CONTROLS TO PREVENT HAIRLINE CRACKS.

SOLUTION - DEVELOP HIGH SPEED PULSE PLATING OF THE CONTACTS. THIS WILL ELIMINATE THE REQUIREMENT FOR MASKING. CLEANING TO REMOVE THE MASKING RESIDUE AND REDUCE COST.

(1055) TITLE - REMOVE GOLD FROM COMPONENT LEADS

PROBLEM - GOLD PLATING, USED ON MOST ACTIVE DEVICE LEADS MUST BE REMOVED BY MANUAL DOUBLE SOLDER DIPPING PER MIL STANDARDS. THIS IS SLOW AND COSTLY BUT NECESSARY TO PREVENT GOLD EMBRITTLEMENT OF SOLDER JOINTS WHICH COULD RESULT IN PREMATURE FAILURE.

SOLUTION - DEVELOP AN AUTOMATED MACHINE FOR REMOVING GOLD FROM COMPONENT LEADS BY THE REQUIRED DOUBLE SOLDER DIP METHOD.

(1058) TITLE - SUBMINIATURE COMPONENT PACKAGING

PROBLEM - ULTRA HIGH DENSITY PCB'S ARE NEEDED AND CAN NOW BE MANUFACTURED WITH 5 MIL LINES AND 5 MIL SPACES. THIS ORDER OF BOARD DENSITY CANNOT BE FULLY UTILIZED WITH A SERIES OF CASES SUCH AS TO-CANS AND DIPS. SINCE THEIR LEAD SPACES REQUIRE TOO MUCH AREA.

SOLUTION - ADAPT THE HERMETICALLY SEALED (PASSIVATED) CHIP TO THE NEW ULTRA HIGH DENSITY PCB. HYBRID TYPE COMPONENTS WILL REQUIRE LITTLE MODIFICATION. ACTIVE DEVICES - TRANSISTORS AND INTEGRATED CIRCUITS - WILL REQUIRE PASSIVATION.

(1061) TITLE - STANDARDIZED MASKING TECHNIQUES FOR PCB ASSEMBLIES

PROBLEM - NO STANDARDIZED CONFORMAL MASKING TECHNIQUES ARE IN EXISTENCE THROUGHOUT INDUSTRY. MATERIALS AND TECHNIQUES ARE SELECTED BY PERSONNEL ACCORDING TO THEIR OWN JUDGEMENT PRIOR TO CONFORMAL COATING. DAMAGE RESULTS WHEN WRONG JUDGEMENT WAS USED.

SOLUTION - DEVELOP STANDARDIZED MASKING MATERIALS AND TECHNIQUES BASED UPON WHICH TYPE OF AREAS ON THE PCB ASSEMBLY ARE TO BE FREE OF CONFORMAL COATING. PARAMETERS SUCH AS TERMINAL GEOMETRY, HOLE PATTERNS, HEAT SINK ZONES WILL BE EVALUATED.

	PRIOR	P1	P2	P3	P4	E5
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150

400

250

NET FIVE YEAR PLAN
RCS DRCM 126

FUNDING (\$0000)

COMPONENT -- INTEGRATED ELECTRONICS	PRIOR	E1	E2	E3	E4	E5
(1062) TITLE - PREVENTING BRITTLE COPPER CIRCUITRY PROBLEM - BRITTLE CLADDING FOIL AND BRITTLE ELECTRODEPOSITED COPPER FOR PUB'S IS A PREVALENT PROBLEM. NO PROCEDURE EXISTS FOR THE EARLY DETECTION OF EMERITELLE IN COPPER ELECTRODEPOSITS.						

SOLUTION - MEASURE THE DUCTILE-TO-BRITTLE TRANSITION IN COPPER DEPOSITS. THE MEASUREMENT OF BRITTLE TRANSITION PROVIDES A MEANS FOR THE EARLY DETECTION OF THE CHANGE FROM DUCTILE TO BRITTLE.

(1067) TITLE - USE OF ELECTROLESS NICKEL FOR ON PUB CONNECTORS

PROBLEM - GOLD OVER NICKEL PLATING USED ON ONE PIECE CARBON EDGE CONTACTS IS A MAJOR COST ITEM. THE COST CAN BE REDUCED BY REPLACING GOLD WITH A BASE METAL ALLOY.

SOLUTION - NICKEL BOKON PROVIDES A SATISFACTORY CONTACT MATERIAL AND HAS AN INEXPENSIVE ELECTROLESS PLATING PROCESS. THE REMAINING PROBLEMS OF UNWANTED PLATING AND OCCASIONAL FAILURES TO STRIKE SEEM TO HAVE A HIGH PROBABILITY FOR SOLUTION.

(1072) TITLE - MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI WFG

PROBLEM - LOW VOLUME PURCHASE OF LSI CHIPS DOES NOT LEND ITSELF TO CIRCUIT VARIATIONS. LARGER THAN NEEDED NUMBERS OF CHIPS MUST BE ORDERED TO GET THE PRODUCER'S ATTENTION. A LOW-VOLUME CHIP CAPABILITY IS NEEDED.

SOLUTION - ANALYZE ALL LSI RESEARCH RESULTS AND SINGLE OUT NEW PROCESSING TECHNIQUES. ESTABLISH A MILITARY CAPTIVE DESIGN AND PRODUCTION LINE. DEVELOP SOFTWARE FOR CAD OF LSI CIRCUITS. PRODUCE VARIATIONS OF SEVERAL CIRCUIT FAMILIES.

(1074) TITLE - ELIMINATE GOLD OR CABLE CONNECTOR PINS

PROBLEM - GOLD FLASH OVER NICKEL FLAME IS STANDARD FOR PINS IN MILITARY CONNECTORS. GOLD IS EXPENSIVE AND A SUBSTITUTE IS NEEDED.

SOLUTION - EVALUATE PALLADIUM, TIN-NICKEL, AND NICKEL WITH OR WITHOUT TIN OR INIUM AS A LUBRICANT. SET UP TEST FLATING AND OTHER PROCESS'S FOR APPLYING THE NEW METALS. COINCIDATE WITH APPL.

(1077) TITLE - PRODUCTION METHODS FOR A MILLIMETER MODULAR TRANSPOINTER

PROBLEM - TRANSPORTERS, POWER SUPPLY, AND MANUFACTURATION LABOR AND ARE HIGH COST. THEY ARE USED ONLY ONCE. THEY MUST RECEIVE A GUIDANCE RADAR SIGNAL. BEFORE IT, FORM A GUIDE, FREELY TRANSMIT IT TO THE GUIDANCE RADAR. MUST WAIT FOR A HIGHLY POSITIONED

SOLUTION - BUILD CONSTRUCTION TO A FORM THAT MINIMIZES MFG. COST. MODULARIZE TRANSPORTERS BY PROVIDING ANTECHAMBERS WHICH RECORDING MODULES. EXCHANGES INFORMATION WITH OTHER MODULES. THESE MODULES WILL SUPPLY CONTROL. BUILD MODULES TO FIT IN A MILLIMETER MODULAR TRANSPOINTER.

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING (\$000)				
				PRIOR	E1	E2	E3	E4
(1103)	TITLE - STABLE MATERIALS & MANUFACTURING FOR MULTILAYER PCB	(CONTINUE{}						
		PROBLEM - MATERIAL FAILURE AND INTERLAYER MIS-REGISTRATION IN MULTILAYER CIRCUIT BOARDS INCREASES WITH THINNER BASE LAMINATES. SPECIFICATIONS FOR RAW MATERIALS AND CONTROL ON LAMINATES THAT WILL REDUCE BOARD STRESSES INTRODUCED BY BONDING ARE REQUIRED.	SOLUTION - ESTABLISH A RELATIONSHIP BETWEEN MATERIAL VARIABLES AND DIMENSIONAL STABILITY. APPLY DATA TO FOSTER MATERIALS AND BOARD FABRICATION METHODS THAT REDUCE FREQUENCY OF MISREGISTERED BOARDS AND BOARD FAILURE DUE TO MATERIAL FAILURE.	500				
(3164)	TITLE - COMPONENT SITE PRINTED CIRCUIT BOARD SOLDERING MOUNTING	PROBLEM - THERE IS NO KNOWN METHOD FOR HOLDING COMPONENTS IN ALIGNMENT FOR MOUNTING.	SOLUTION - REFINED PROCESS FOR FOIL SITE MOUNTING OF COMPONENTS TO ACCOMMODATE FLEXIBLE CIRCUITS.	350				
(3263)	TITLE - MANUFACTURE FOR PCB UTILIZING LEADLESS COMPONENTS	PROBLEM - THE VOLUME, WEIGHT, QUANTITY, RELIABILITY AND COST OF PCB'S USING AXIAL LEADED COMPONENTS CAN BE SUBSTANTIALLY IMPROVED.	SOLUTION - USE LEADLESS COMPONENTS CURRENTLY AVAILABLE TO REDUCE THE REQUIRED AREA BY A RATIO OF 2 TO 1 WITH A CORRESPONDING WEIGHT REDUCTION. RELIABILITY MAY BE INCREASED DUE TO A REDUCTION IN THE NUMBER OF PLATED THRU HOLES REQUIRED FOR INTERCONNECTIONS.	250	400			
(3369)	TITLE - UTILIZATION OF LARGE SCALE INTEGRATION (LSI) TECHNIQUES	PROBLEM - THE DESIGN AND UTILIZATION OF LSI ELECTRONICS IN AN ADVANCED DEVELOPMENT PROGRAM IS NOT FEASIBLE BECAUSE OF THE INABILITY TO MAKE QUICK CHANGES.	SOLUTION - CONDUCT PROJECT FOR LSI DEVELOPMENT, QUALIFICATION, PRODUCTION ENGINEERING AND PILOT RUN FOR THE STINGER ALTERNATE MISSILE GUIDANCE ELECTRONICS.	400				
(3411)	TITLE - MANUFACTURE OF NON PLANAR FRATED CIRCUIT BOARDS	PROBLEM - USE OF FLAT CIRCUIT BOARDS RESULTS IN COMPLEX AND EXPENSIVE INTERCONNECTIONS WITH LOWERED RELIABILITY.	SOLUTION - DEVELOP THE PROCESSES TO PRODUCE NON-PLANAR CIRCUIT BOARDS SHAPED TO FIT THE AVAILABLE COMPARTMENTS. CIRCUIT PATTERNS WILL BE EXPOSED ON THE INSIDE WITH A PROJECTION MECHANISM OR WITH SOFT X-RAYS. A METHOD OF MASS SOLDERING WILL BE DEVELOPED.	220	550	738		

KM1 FIVE YEAR PLAN
KC: CRAFT 126

COMPONENT	-- INTEGRATED ELECTRONICS	FUNDING (\$1000)				
		P1/PK	H1	H2	E3	E4
(3415) TITLE - AUTOMATIC PHOTOPRAPHIC FABRICATION OF THICK FILM MICROCIRCUIT						
		380	380			
PROBLEM - SCREEN PRINTING OF FINE LINES DOES NOT ALLOW HIGH DENSITY DUE TO RHODOLY OF ZINC SYSTEMS.						
SOLUTION - DEVELOP THICK FILM HYDRO PROCESSING CAPABILITY INCLUDING AUTOMATIC PHOTOLITHOGRAPHIC TECHNIQUES AND ELECTROLYTIC LINE PLATEAU OF FINE LINE THICK FILM CIRCUITS.						
COMPONENT	-- OPTICS					
(1054) TITLE - NEW PROCESS FOR HOLOGRAPHIC OPTICAL COMPONENTS						
		375				
PROBLEM - FABRICATION TECHNIQUES FOR HOLOGRAPHIC OPTICAL COMPONENTS ARE LIMITED TO LAB SAMPLES OF SELECTED OPTICAL COMPONENTS. LIMITATIONS ON SYSTEM PERFORMANCE WITH THE TECHNOLOGY IS TRANSFERRED FROM THE LAB TO PRODUCTION IS NOT KNOWN.						
SOLUTION - ESTABLISH A PILOT PROCESS FOR MAKING HOLOGRAPHIC OPTICAL ELEMENTS WHICH WILL BE USED TO DETERMINE AND OVERCOME THESE LIMITATIONS.						
		300				
(1069) TITLE - MANUFACTURE OF GRADIENT INDEX LENSES						
PROBLEM - MILITARY OPTICAL SYSTEMS ARE HEAVY, AWKWARD, EXPENSIVE AND DIFFICULT TO MAINTAIN. ASYMETRIC LENSES HAVE COMPLEX SHAPES REQUIRING SPECIAL FOLISHING TECHNIQUES WHICH CAUSE THE LENSES TO BE COSTLY.						
SOLUTION - ESTABLISH MANUFACTURING PROCESS FOR THE PRODUCTION OF OPTICAL QUALITY GRADIENT INDEX LENSES.						
(1096) TITLE - IMPARED TRANSMITTING HALIDE GLASSES						
		250	340			
PROBLEM - FABRICATION OF INFRARED TRANSMITTING HALIDE GLASSES IS EXPENSIVE AND HAS A LOW YIELD DUE TO THE CRITICAL RESOLUTION REQUIRED. ALSO A PROBLEM EXISTS IN ACCURATELY TEST AND EVALUATE THE OPTICAL ELEMENTS DURING FABRICATION.						
SOLUTION - ESTABLISH A HALIDE GLASS INFLAT FOR FILTER OPTIC ELEMENTS, OPTICAL COMPONENTS, AND FARADAY ROTATORS INCLUDING MIRRORS AND PROCESSES AND IMPROVED MEASUREMENT FOR OPTICAL SURFACES.						
(3152) TITLE - PRODUCTION OF OPTICAL ELEMENTS (CAM)						
PROBLEM - HIGH GRADE OPTICS IN Moderate QUANTITY CANNOT BE PRODUCED AT LOW COST WITH REPEATABILITY.						
SOLUTION - APPLY COMPUTER CONTROL TO PROCESS OPERATIONS WITH SENSOR CONTROL AND PROCESS FEEDBACK TO ASSURE HIGH YIELD.						
		300	350			

WT FIVE YEAR PLAN
KCS OCT 126

FUNDING (\$000)

COMPONENT -- OPTICS

(3445) TITLE - PRECISION MACHINING OF OPTICAL ELEMENTS
CONTINUE[]

PROBLEM - EXISTING PRECISION MACHINING FACILITIES CANNOT KEEP UP WITH THE DEMAND. MEET OPTICAL DESIGN REQUIREMENTS. MEET PRODUCTION SCHEDULES. AND STAY WITHIN REASONABLE COST BOUNDARIES.

SOLUTION - INTEGRATE BOTH THE WELL PROVEN ERDA DEVELOPED SINGLE POINT DIAMOND MACHINING CAPABILITIES AND THE DEVELOPING INTERFEROMETRIC AIDED AND COMPUTER CONTROLLED TECHNOLOGY INTO A MANUFACTURING METHOD.

COMPONENT -- SEEKERS

(1043) TITLE - MFG PROCESS FOR INFRARED FOCAL PLANE ARRAY

PROBLEM - THE GREATEST OPPORTUNITY FOR FABRICATION OF INFRARED FOCAL PLANE ARRAYS IS TO MATE AN ARRAY OF 1K DETECTORS TO A SILICON CHARGE COUPLED DEVICE. HOWEVER PROBLEMS ARE ENCOUNTERED IN ACHIEVING A RELIABLE INTERFACE BETWEEN THE CCD AND ARRAY OF DETECTORS.

SOLUTION - DEVELOP A PROCESS THAT WILL ALLOW AN INDIUM BUMP ON THE BACKSIDE OF EACH ELEMENT OF AN IP ARRAY WHICH CAN BE JOINED IN GOOD ELECTRICAL AND MECHANICAL CONNECTICL WITH THE TERMINAL OF AN ELEMENT OF A CCD SIGNAL PROCESSING ARRAY.

(1044) TITLE - PRODUCTION OF INFRARED SEEKER ELECTRONICS USING VLSI (CAM)

PROBLEM - LOW COST, LIGHT WEIGHT, MINIMUM VOLUME GUIDANCE ELECTRONICS ARE REQUIRED FOR FUTURE FIRE AND FORGE MISSILE SYSTEMS. CURRENT PACKAGING USES DISCRETE COMPONENTS AND HERMETICALLY SEALED ENCLOSURES WITH CIRCUITS ON PC BOARDS ON MOTHERBOARDS IN HOUSINGS.

SOLUTION - USE FOUR OR FIVE STANDARD CHIPS FROM 100 PROGRAM IN VLSI (VERY LARGE SCALE INTEGRATED CIRCUITS) TECHNOLOGY AND DEVELOP MANUFACTURING PROCESSES TO PRODUCE INFRARED IMAGING SEEKER ELECTRONICS USING THIS TECHNOLOGY.

(1042) TITLE - IMP MFG PROCEDURE IN DIAFFER FOCAL PLANE ARRAY SEEKERS

PROBLEM - SHAPING FOCAL PLANE ARRAY LENSFACTORS MAKE REDUCTION IN INFRARED SEEKER MECHANICAL COMPLEXITY AND SIZE NOT PREVIOUSLY POSSIBLE. ACHIEVING HIGH PRODUCTION RATE WITH HIGH YIELD IN FABRICATION OF THIS NEW TYPE SEEKERHEAD IS A PROFILE.

SOLUTION - ESTABLISH MANUFACTURING PROCEDURES FOR LARGE VOLUME HIGH YIELD PRODUCTION OF STARING FOCAL PLANE ARRAY DETECTORS AND SMALL DIAMETER SEEKERHEADS.

COMPONENT	TITLE	FUNDING (\$000)
		PK10K P1 t2 t3 t4 t5
OPTICS	CONTINUE[]	
(3445)	PRECISION MACHINING OF OPTICAL ELEMENTS	700 625 403
		550 500
SEEKERS	MFG PROCESS FOR INFRARED FOCAL PLANE ARRAY	400 350
(1043)		1000 1500 1600
(1044)	PRODUCTION OF INFRARED SEEKER ELECTRONICS USING VLSI (CAM)	
(1042)	IMP MFG PROCEDURE IN DIAFFER FOCAL PLANE ARRAY SEEKERS	

NET FIVE: YESTERDAY
PLS. RECALL 126

COMPONENT -- SICKENS

(314) TITLE - MILLIMETER OPTICAL SEEKERS FOR SUBMERSIBLE APPLICATION

PROBLEM - LOW QUANTITY PRODUCTION IS TOO COSTLY FOR THE SYSTEM REQUIREMENTS.

SOLUTION - PROVIDE AN ALIGNMENT AND TEST FIXTURE TO SPEED ASSEMBLY AND TEST OF THE SENSORS IN GIMBAL ASSEMBLY. ESTABLISH A METHOD OF MOLDING THE STEPS IN THE LENS. APPLY PHOTOLITHOGRAPHIC TECHNIQUES TO THE XMITTER/RCVR STRUCTURAL ASSEMBLY.

(315) TITLE - IMPROVED MANUFACTURE OF INFRARED SUBMERSIBLE SEEKERS

PROBLEM - LOW YIELD OF SEEKER CONSTRUCTION IS DUE TO HANDLING AND CHECKOUT OF GYRO OPTICS.

SOLUTION - PROVIDE LOWER COST SPHERICAL ELEMENTS TO REPLACE THE ASPHERICS. PROVIDE A FIBER OPTIC CUTTING METHOD THAT WILL FELTINATE THE NEED TO POLISH THE FIBER INUS. OPTIMIZE THE FILTER OPTIC MATERIALS TO EXTEND THE OPERATING RANGE TO LONGER WAVELENGTHS.

(3428) TITLE - IMPROVED TECHNIQUES FOR CIRCUIT APERTURE MULTISPECTRUM SENSORS

PROBLEM - PRESENT METHODS FOR MAKING LINE HANG ON, A LINE AT A TIME BASIS, DOES NOT PERMIT GOOD CONTROL OF PERFORMANCE.

SOLUTION - MANUFACTURING TECHNIQUE AL REQUIRES TO ENSURE THAT COMPONENTS IN MODERATE QUANTITIES WITH CLOSE TOLERANCES.

COMPONENT -- SENSORS

(3159) TITLE - WIDE AREA MERCURY-CADMIUM-TELLURIDE GARNET DETECTORS

PROBLEM - LARGE AREA MERCURY-CADMIUM-TELLURIDE GARNET DETECTORS FOR IN SEEKERS ARE EXPENSIVE BECAUSE OF HIGH MATERIAL COST AND LOW YIELD. THE MATERIAL IS HARD TO GROW TO THE PERTICHEMICAL BALANCE. SLICING, INK IMPLANTATION AND/OR DIFFUSION ARE ITCHY.

SOLUTION - FIND THE EXACT CHEMISTRY FOR GOOD DETECTOR OUTPUT. LOOK AT CLOSED LGCP COMPUTER CONTROL OF CRYSTAL PULLING. CRYSTALLIZING, X-RAY CHARACTERIZATION, SAWING, POLISHING, ION IMPLANTATION, AND TESTING.

(3160) TITLE - ION IMPLANTED THIN FILM TRANSISTORS

PROBLEM - PROCESSES FOR MANUFACTURING THIN FILM TRANSISTOR PRODUCTS INCONSISTENT RESULTS DUE TO INABILITY TO CONTROL THE CHARACTERISTICS AND ELECTRICAL ACTIVITIES OF THE MATERIAL.

SOLUTION - ESTABLISH ION IMPLANT TECHNOLOGY APPLICABLE TO THE DESIGN AND FABRICATION OF THIN FILM ACTIVE DEVICES.

FUNDING (100%)

PROJCR F1 F2 F3 F4 F5

(CONTINUED)

41% 7% 0

MMT FIVE YEAR PLAN
RCS ORCMT 126

FUNDING (\$1000)

COMPONENT -- SENSORS	(CONTINUED)	PRIORITY	FUNDING (\$1000)			
			E1	E2	E3	E4
(1104) TITLE - PROG METH FOR MILLIMETER WAVE IMPATT DIODES	1190	1190				
PROBLEM - SENSOR ANTENNA SYSTEM NEEDS RELATIVE ALIGNMENT FACTORS BETWEEN DIELECTRIC LENS, MOBILE REFLECTOR AND ACTIVE ANTENNA ELEMENT REQUIRING ANTENNA FEED UNITS BUILT BY HAND.						
SOLUTION - ESTABLISH METHODOLOGY FOR CONSTRUCTING MONGPULSE ANTENNA INTO A COMPATIBLE PACKAGE WITH A 5 MILLIRADIAN BEAM WIDTH AT 94 GHZ.	1160					
(1105) TITLE - LARGE DIAMETER SILICON		36R				
PROBLEM - MILITARY REQUIREMENTS FOR DETECTORS ARE EXCEEDING STANDARD SIZES. SPECIAL TOOLING AND REPLACEMENT PARTS CREATE A PREMIUM ON COST AND TIME DELAYS.						
SOLUTION - INVESTIGATE ETCHING, ULTRASONIC CAVITATION, LASER SCRIBING, SAWING AND TREPPING FOR CUTTING .8 IN DISCS FROM 3 IN WAFERS. REDUCE STRESS AND PREVENT FAILURES.						
(1106) TITLE - HIGH PERFORMANCE MMW IMPATTS USING THIN SILICON	250	340				
PROBLEM - COST AND PERFORMANCE OF MILLIMETER WAVE (MMW) IMPATT DIODES HAVE POOR REPRODUCIBILITY RESULTING IN LOW DEVICE YIELDS.						
SOLUTION - ESTABLISH METHODOLOGY THINNING SILICON TO LESS THAN 10 MICRONS AND DOPING CONTROLS UTILIZING LOW TEMPERATURE PROCESSES.						
(1104) TITLE - IMPROVED SANDWICH DETECTOR FABRICATION FOR INFRARED SEEKERS	500	500				
PROBLEM - FABRICATING TWO DETECTORS INTO A SANDWICH CAUSES LOWER SENSITIVITY, CROSS TALK, POOR TRANSMISSION, AND PROVIDES A DEFECTOR TO THICK FOR A COMMON FOCUS.						
SOLUTION - ESTABLISH METHODOLOGY FOR PRODUCING DETECTOR OPERATING IN TWO SPECTRAL BANDS FROM ONE PIECE OF MATERIAL.						

MAT FIVE YEAR PLAN
RCS DRCT 126

FUNDING (\$C/2)

COMPONENT	--- SENSORS	CONTINUED					
		PRIOR	R1	R2	R3	R4	R5
(3177) TITLE - IMPROVED MANUFACTURING PROCESS FOR SUBMISSILE ELECTRONIC SUBSYSTEM							
PROBLEM - PRESENT MANUFACTURING PROCESSES SUBSTANTIALLY INCREASE THE COST OF HOMING SUBSYSTEMS.							
SOLUTION - INVESTIGATE VOLUME METHODS FOR PRODUCING ELECTRONIC HOMING SUBSYSTEMS.							
(3177) TITLE - AUTOMATIC INITIAL SENSOR FABRICATION							
PROBLEM - INERTIAL SENSOR FABRICATION REQUIRES PRECISION MACHINING AND ASSEMBLY METHODS WITH SEVERAL ITERATIONS, ALL OF WHICH INCREASE COST.							
SOLUTION - ESTABLISH AUTOMATIC FLUID FILL STATION AND SET UP PILOT STATION FOR AUTOMATIC BALANCING OF CYRO ROTIFERS BY LASER REMOVAL OF MATERIAL							
COMPONENT --- WINDOWS/RADOME							
(11242) TITLE - FABRICATION OF COMPOSITE RADOME STRUCTURES							
PROBLEM - THE BASIC MATERIAL FOR COMPOSITE RADOMES IS EXPENSIVE (\$25/LB). THE FABRICATION PROCEDURES FOR PRODUCING THE RADOME STRUCTURE ARE COMPLEX AND EXPENSIVE, WITH SOME PROCEDURES BEING PROPRIETARY.							
SOLUTION - ESTABLISH FIBERGLASS REINFORCED TEFILON AS A REPLACEMENT FOR THE CURRENT DUAL WALL FOAMED PROPRIETARY MATERIAL (URVACID). OPTIMUM PROCESSING WILL BE SELECTED BASED ON MECHANICAL PROPERTIES AND SLFDR TEST RESULTS AND WILL BE SCALLED UP.							
(11244) TITLE - IMPROVED FABRICATION OF ECLP RADAR MODULES							
PROBLEM - DOME PHASED RAY RADARS TYPICALLY REQUIRE 25,000 RADIATING ELEMENTS PER SYSTEM. MANUFACTURING PROCESSES ARE NEEDED TO ASSEMBLE THESE ELEMENTS INTO STANDARD CLUSTERS (MODULES) WHICH WILL BE USED AS THE BASIC BUILDING BLOCK FOR THE DOMED RADAR SYS.							
SOLUTION - MANUFACTURING TECHNIQUES INCLUDING ETCHING, PUNCHING, MOLDING AND FORMING WILL BE ESTABLISHED FOR SYMLINE CIRCUITS AND GROUND PLANES. SOFTWARE WILL BE DEVELOPED FOR NUMERICAL CONTROLLER, PLANAR PRINTING, ETCHING, MASK PUNCHING AND TESTING.							
(11245) TITLE - RF AND LASER HARSHENING OF MISSILE DOMES							
PROBLEM - CURRENT RADOMES ARE SUSCEPTIBLE TO DAMAGE BY LASER ENERGY AND ALSO PERMIT LASER AND RADAR FREQUENCY ENERGY TO DAMAGE THE DETECTOR.							
SOLUTION - DEVELOP RF SPATTERING WITHOUT TO APPLY INFLUM OXIDE, TIN OXIDE AND AN ALUMINUM MATERIAL TO THE INSIDE OF THE GLASS OR PLASTIC RADOME. USE COATINGS THAT FAIL ONLY AT 1.0 MICRON WAVELENGTHS.							

WMT FIVE YEAR PLAN
RCS DRCT 126

COMPARATIVE HANDBOOKS

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PROBLEM - THERE IS NO EXISTING ECONOMICAL MANUFACTURING PROCESSES FOR LARGE RAUOMES FROM CURRENT MATERIALS.

SOLUTION - SLIPCAST SILICON POWDER AND FIRE THE FAUIONE IN A NITROGEN ATMOSPHERE.

THE INFLUENCE OF THE CULTURE ON THE LANGUAGE 13

PROBLEM - MILKERS AND WINNERS FOR HIGH ENERGY LASFR APPLICATION ARE EXPENSIVE TO FABRICATE AND HAVE POOR REFRACTCIBILITY.

SOLUTION - ESTABLISH METHODS FOR PRODUCING MEDIUM QUANTITIES OF MIRRORS AND
VARIFOCALS AT LOWER COST AND GREATER UNIFORMITY.

THEORY OF WATER IN GELS

PROBLEM — THE CURRENT PROCESS FOR THE PRODUCTION OF SILICON NITRIDE, A BATCH PROCESS, STARTS WITH HIGH PURITY SILICON AND TAKES PLACE AT 1400°C IN AN OVEN.

SOLUTION - The proposed process, effectively developed at AMRRC, uses low grade ferro-silicon and operates at 1160-1250°C in a continuous process. The

STRUCTURE

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— WFG FROCI SSES FOX FUSED SILICA FILTERS

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LOW-COST MFG TECHNIQUES FOR HI PRODUCTION MISSILE VANE ASSEMBLIES

**ALUMINUM - METAL CONTROL VANES, FINS AND MISSILE FAIRINGS CAUSE HIGH
CROSSWINDS, LIGHT FLIGHT FEETLINES AND LONG LEAD TIME**

**PLASTIC - FABRICATION OF COMPOSITE MATERIALS OFFER AN OPPORTUNITY TO MEET LOW
COST, EASY AND FLEXIBLE CONSTRUCTION CRITERIA. EFFICIENT SERVICES FOR AUTOMATION OF
MANUFACTURING PRODUCTION ON AN VACUUM LAYING MACHINE.**

FUNDING (\$000)	
PRIOR	81
	82
	83
	84
	85
390	350
	300
	500
	700
	500

AD-A100 514 ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY ROCK ISLAND IL F/G 5/1
MANUFACTURING METHODS & TECHNOLOGY PROGRAM PLAN, CY 1981.(U)
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MMI FIVE YEAR PLAN
RCS DRIFT 126

COMPONENT -- AIRFRAMES-COMPOSITES

(1055) (CONTINUED)

TITLE - LOW COST CARBON/CARBON NOSETIPS

PROBLEM - THE WEAVING PROCESS TO FABRICATE CARBON/CARBON NOSETIP PREFORMS IS LABOR INTENSIVE BECAUSE OF THE FINEWEAVE CENTER-TO-CENTER YARN SPACINGS. IN ADDITION, PREFORMS USE EXPENSIVE GRAPHITE YARN AND REQUIRE LONG IMPREGNATION CYCLES.

SOLUTION - DEVELOP OPTIMAL FABRICATING PROCEDURES FROM LOWER COST MATERIALS, PITCH RESIN AND T-300 CARBON FIBERS. UTILIZATION OF SHORTER DENSIFICATION CYCLES PREFORMS, AND FIBER SPACINGS WILL PROVIDE THE MEANS FOR REDUCING CYCLE TIMES.

(1056) TITLE - HIGH ANGLE TAPE WRAPPED HEATSHIELDS

PROBLEM - DATA HAS SHOWN THAT THE FRICSION PERFORMANCE OF TAPE WRAPPED HEATSHIELDS IMPROVES AS THE SHINGLE ANGLE INCREASES ABOVE 30 DEGREES. CURRENT MFG TECHNIQUES DO NOT LEAD THEMSELVES TO HIGH WRAP-ANGLE HEATSHIELDS.

SOLUTION - DEVELOP IMPROVED WRAPPING TECHNIQUES TO CURRENT TAPE WRAPPING EQUIPMENT AND PROCESSING TECHNOLOGY.

COMPONENT -- COMPONENTS

(1075) TITLE - REAL TIME ULTRASONIC IMAGING

PROBLEM - EXISTING ACOUSTICAL HOLOGRAPHY INSP. SYS PRODUCES UNSATISFACTORY VIBRO IMAGES DUE TO POOR RESOLUTION, SIGNAL NOISE AND LOW SPATIAL FREQ. AVERGATIONS.

SOLUTION - A 3 CHANNEL PIPELINE PROCESSOR WITH ASSOCIATED 512X512X8 MEMORIES WITH A 30 FRAMES/SEC DISPLAY CAPABILITY. THIS SYS WOULD ELIMINATE AVERGATION, IMPROVE CONTRAST, AND REDUCE SIGNAL NOISE.

(324?) TITLE - MANUFACTURING TECHNOLOGY FOR DIF CASTING

PROBLEM - WEIGHT AND SPACE CONSTRAINTS HAVE RESULTED IN COMPLEX AND HIGH DENSITY CONFIGURATIONS OF METAL PARTS WHICH ARE MACHINED.

SOLUTION - ESTABLISH AND PROVE-OUT DIF CASTING TECHNIQUES FOR THESE COMPLEX CONFIGURATION.

COMPONENT -- FORMING

(324?) TITLE - CONFORM FABRICATION PROCESS

PROBLEM - CONSIDERABLE COSTS ARE INCURRED IN TRANSPORTATION, DAMAGE AND LOSS OF SEMI-FINISHED PARTS.

SOLUTION - REVIEW VISUAL PARTS AND DETERMINE IF THEY CAN BE PRODUCED BY CONFORM PROCESS.

FUNDING (\$000)

	PRIOR	E1	E2	E3	E4	E5
(1055)	550	490	450			

MAT FIVE YEAR PLAN
RCS DRCHT 126

COMPONENT --	TITLE	FUNDING (\$000)	FUNDING (\$000)				
			PRIOR	81	82	83	84
MACHINING							
(1021) COMPONENT -- MACHINING	TITLE - COMPUTERIZED PROC. PROC. PLAN FOR MACH CYLINDRICAL PARTS (CAM)	240	234				
PROBLEM - PRESENT MANUAL METHOD FOR PRODUCTION PROCESS PLANNING OF MACHINED CYLINDRICAL METAL COMPONENTS ARE INADEQUATE DUE TO HIGH PROCESS PLANNING COSTS AND A LACK OF STANDARDIZATION.							
SOLUTION - DEVELOP A COMPUTER SOFTWARE SYSTEM FOR PROCESS PLANNING OF MACHINED CYLINDRICAL PARTS. THE SYSTEM WILL BE MANUFACTURER-INDEPENDENT AND WILL INCORPORATE PROCESS DECISION MODELING.							
CATEGORY							
(1028) CATEGORY	TITLE - OPTIMIZED MANDREL FAB AND UTILIZATION F/COMP MOTOR CASES	700	461	400			
PROBLEM - OPTIMIZING PRODUCTION PROCEDURES TO OBTAIN LOWEST UNIT COST WHILE MAINTAINING RELIABILITY IN FABRICATION.							
SOLUTION - ESTABLISH PRODUCTION PROCEDURES AND PRODUCTION RATES FOR MANDREL FABRICATION. THIS WILL PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO CURRENT AND FUTURE MOTOR COMPONENT REQUIREMENTS.							
COMPONENT -- MOTOR CASES							
(1029) COMPONENT -- MOTOR CASES	TITLE - INTEGRAL ROCKET MOTOR COMPOSITE POLE PIECES AND ATTACHMENTS	350	350				
PROBLEM - CURRENT FILAMENT WOUND COMPOSITE ROCKET MOTOR CASES REQUIRE FORGED METAL POLE PIECES, NOZZLE CLOSURE ATTACHMENT RINGS, AND OTHER ATTACHMENT RINGS. THESE COMPONENTS ARE EXPENSIVE, AND REQUIRE LONG LEAD TIME PROCUREMENT.							
SOLUTION - ESTABLISH A FILAMENT WOUND PRODUCTION PROCESS FOR FABRICATING COMPOSITE MOTOR CASES WITH INTEGRAL POLE PIECES, AFT ATTACHMENT RINGS, AND FORWARD AND AFT DOME SECTIONS.							
(3204) COMPONENT -- ROTARY ROLL FORMING	TITLE - PRODUCTION PROCESS FOR ROTARY ROLL FORMING	300	159				
PROBLEM - MECHANICALLY JOINING OF WELDING A CONVENTIONAL CLOSURE TO COMMERCIAL TUBING IS EXPENSIVE.							
SOLUTION - DEVELOP METHODS FOR PRODUCING INTEGRAL NOZZLES WITH TURULAR PRODUCTS USING ROTARY ROLL FORMING TECHNIQUES.							

MMT FIVE YEAR PLAN
RCS DRCT 126

COMPONENT	TITLE	(CONTINUED)			
		PRIOR	E1	82	83
(341c) RCS	MOTOR CASES			84	85

500

PROBLEM - THE MANUFACTURING PROCESSES FOR HIGH STRENGTH STL RKT MTR CASES

FOR THE MLRS (FORMERLY GSRS) RESULT IN A RESIDUAL STRESS PATTERN (RADIAL) THAT DOES NOT TAKE FULL ADVANTAGE OF THE MATERIAL PROPERTIES.

SOLUTION - THIS PROGRAM WOULD DEVELOP AUTOMATED FRACTURES TO PERFORM THERMO-MECHANICAL FERRICATION OF THE STEEL MOTOR CASES. THIS PROCESS WILL PRODUCE A MORE DESIRABLE STRESS PATTERN FOR INCREASED PERFORMANCE.

COMPONENT -- MOTOR COMPONENTS

(105e) TITLE - PRODUCTION METHODS FOR VSTT TURBINE ROTORS

PROBLEM - TURBINE ROTORS ARE SUBJECT TO STRESS AND FATIGUE LEVELS AS ENGINE THRUST INCREASES.

SOLUTION - IMPLEMENT PILOT PRODUCTION PROGRAM TO ESTABLISH COST-EFFECTIVE PRODUCTION AND TEST TECHNIQUES TO FABRICATE TURBINE ROTORS WITH INCREASED STRESS AND FATIGUE LEVELS.

(105f) TITLE - LOW COST BRAIDED ROCKET MOTOR COMPONENTS

PROBLEM - RACKET MOTOR COSTS TO MEET DESIGN-TO-COST PRODUCTION GOALS HAVE DICTATED REEVALUATION OF MATERIALS AND PROCESSES. MISSILE CASES COMPRISING 1/2 OF PROPELLANT SYSTEM COST. EMPHASIS MUST BE PLACED ON ESTABLISHING NEW COMPONENT MFG PROCESSES.

SOLUTION - OPTIMIZE THE PRODUCTION PROCEDURES AND RATES FOR INTEGRALLY BRAIDED CASE/NOZZLE COMPONENTS TO PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO FUTURE MOTOR COMPONENT REQUIREMENTS.

(105g) TITLE - REPLACEMENT OF ASBESTOS IN ROCKET MOTOR INSULATIONS

PROBLEM - PRESENT ASBESTOS CONTAINING INSULATORS CAN NO LONGER BE MANUFACTURED AFTER 1991 DUE ITS BEING IDENTIFIED AS A CARCINOGEN. THUS THE COVT HAS LOST THE CAPABILITY OF USING INSULATING MATERIALS THAT HAS PROVEN TO BE AN EXCELLENT "HERMAL BARRIER".

SOLUTION - FILLER MATERIALS OTHER THAN ASBESTOS ARE AVAILABLE. FIBER GLASS AND SILICA HAVE BEEN USED IN SPECIALIZED APPLICATIONS AND WOLLASTONITE LOOKS PROMISING. MATERIALS SPECS AND MOTOF TEST VERIFICATION MUST BE DONE BEFORE A SUBSTITUTE MATERIAL CAN BE USED.

(105h) TITLE - COBALT REPLACEMENT IN MANUFACTURING STEEL FOR ROCKET MOTOR COMP

PROBLEM - CURRENT HIGH PERFORMANCE ROCKET MOTOR COMPONENTS UTILIZE MARAGING STEELS IN LARGE QUANTITIES. COBALT, ONE OF THE KEY INGREDIENTS COMES FROM POLITICAL ESSENTIAL AREAS AND IS BECOMING DIFFICULT TO OBTAIN.

SOLUTION - OPTIMIZE VILL CHOICE ALLOYS AND EVALUATE IN A ROCKET MOTOR THE NEW COBALT FREE VARIETY OF STEEL ALLOYS.

FUNDING (\$0000)

PRIOR	E1	82	83
		84	85

HHT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

COMPONENT	PRIOR	P1	P2	P3	P4	P5
(CONTINUED)						
(1057) TITLE - APPLICATION OF COMMERCIAL GRADE KEVLAR TO ROCKET MOTOR COMP						
PROBLEM - CURRENT MILITARY ROCKET MOTOR COMPONENTS USE KEVLAR 49 FIBER IN LARGE QUANTITIES. THIS AEROSPACE GRADE IS VERY COSTLY.						500
SOLUTION - OPTIMIZE MILL PROCEDURES AND MOTOR COMPONENT PROCESSING METHODOLOGY FOR COMMERCIAL GRADE KEVLAR AND EVALUATE THE PERFORMANCE IN A ROCKET MOTOR COMPONENT ENVIRONMENT						
COMPONENT - NOZZLES						
(3423) TITLE - LOW COST/HIGH PERFORMANCE FIBROUS GRAPHITE ROCKET NOZZLES						
PROBLEM - ROCKET SYSTEMS USING HIGH PERFORMANCE CARBON/CARBON OR PYROLYTIC GRAPHITE NOZZLES INCUR HIGH COMPONENT COST.						
SOLUTION - THIS PROJECT WILL SCALE UP THE FIBROUS GRAPHITE PROCESS TO MAKE FULL-SCALE NOZZLE COMPONENTS AND WILL EXTEND NOZZLE TEST DATA.						
COMPONENT - PROPELLANTS						
(1035) TITLE - DEMONSTRATION OF LOW COST CARBONANE MODIFIER						
PROBLEM - NHC IS USED AS A BALLISTIC MODIFIER FOR SOLID ROCKET PROPELLANTS BUT IS VERY EXPENSIVE DUE TO A LOW YIELD PROCESS.						
SOLUTION - INVESTIGATE ALKyne PROCESS FOR PRODUCTION OF NHC TO REDUCE NET PRODUCT COST.						
(1057) TITLE - LOW COST EXTRUDABLE PYROTECHNIC PELLETING PROCESS						
PROBLEM - PELLETING OPERATION IS A FUNCTION OF PELLET SIZE. THE SMALLER THE PELLET THE GREATER THE COST.						650
SOLUTION - DEVELOP EXTRUDABLE COMPOSITIONS WITH THE SAME IGNITION CHARACTERISTICS AS PELLETS. DESIGN CONTINUOUS OPERATION TO PRODUCE VARIOUS SIZED PELLETS.						
(1053) TITLE - PROD OF NITRO POLYMERS FOR SMOKELESS PROPELLANTS						
PROBLEM - NITROCELLULOSE PLASTICIZER KINDER HAS A VERY LIMITED FLEXIBILITY FOR FORMULATION OF SMOKELESS PROPELLANT COMPOSITIONS.						
SOLUTION - MAKE PRODUCTION OF POLYETHYLENE GLYCOL NITRAMINE POLYMER COMMERCIALLY AVAILABLE.						

MAT FIVE YEAR PLAN
RCS DRAFT 126

COMPONENT	TITLE	CONTINUOUS PROCESS FOR PROPELLANT MANUFACTURE	FUNDING (\$1000)			
			PRIOR	E1	E2	E3
(1544)	-- PROPELLANTS	(CONTINUED)	50	1477		
		PROBLEM - PROPELLANT MANUFACTURE IS GENERALLY A BATCH PROCESS WITH INHERENT PROBLEMS. CURE ACCELERATORS MUST BE AVOIDED SINCE THEY SHORTEN POT LIFE. THE PROCESS HAS HIGH LABOR REQUIREMENTS. HIGH VISCOSITIES RESULT IN DISCARDING THE BATCH.				
		SOLUTION - A CONTINUOUS MIXING AND MOTOR LOADING PROCESS WILL REDUCE PRODUCTION LABOR AND FACILITIES, AND IMPROVE PROPELLANT QUALITY AND RELIABILITY. SAFETY PROBLEMS RELATED TO QUANTITY DISTANCES CAN BE MINIMIZED.				
(3317)	TITLE - CASTING OF PROPELLANTS	PROBLEM - THE END BURNING SUSTAINING CHAIN FOR STINGER IS PRESENTLY CAST AND CURED. MACHINED, INHIBITED WITH FOOT WHICH IS BENDED TO EXTERIOR OF GRAIN.	350			
		SOLUTION - DEVELOP CAST-IN-BOOT PROCESS TO CAST GRAIN DIRECTLY INTO INHIBITOR BOOT.				
(3320)	TITLE - NON-DESTRUCTIVE TESTING (NDT) OF PROPELLANTS	PROBLEM - THE FULL COMPLEMENT ON AFT TEST BY CURRENT METHODS IS TOO EXPENSIVE TO BE USED.	275			
		SOLUTION - DEVELOP A COMPUTERIZED SYSTEM FOR THE ASSESSMENT OF NDT DATA.				
(3404)	TITLE - MANUFACTURE OF ULTRAFINE INERTIUM PERCHLORATE	PROBLEM - PURGING RATES OF SPECIFIC SYSTEMS WILL OFTEN BE OUT OF SPECIFICATIONS BECAUSE OF THE ULTRAPURIFICATION AND REPRODUCIBILITY PROBLEMS.	475	475		
		SOLUTION - THIS PROJECT WILL ESTABLISH A REPRODUCIBLE METHOD OF GRINDING UFAF, EVALUATE THE QUALITY AND REPRODUCIBILITY IN HIGH RATE COMPOSITE PROPELLANT FORMULATIONS AND ESTABLISH QUALITY CONTROL AND PROCESS SPECIFICATIONS.				
(3447)	TITLE - SCALE UP AND DEMO FOR THE RECEVY OF CARBOANE FROM WASTE FROP	PROBLEM - THE PRODUCTION OF V-HEXYLCARBOANE (NHCl) RESULTS IN UP TO 10 FCT REJECTED MATERIAL BECAUSE IT WILL NOT MEET BALLISTIC RATE REQUIREMENTS.	375			
		SOLUTION - THE SCRAP PROPELLANT CKA IS DISSOLVED IN FENTANE, DRIED AND DISTILLED TO PURIFY IT. THE NHCl THAT WOULD BE SCRAPPED IS THUS RECOVERABLE. THIS PROJECT WILL SCALE UP THE LABORATORY PROCESS SUCH THAT THE TOTAL PROCESS CAN BE DEMONSTRATED.				
(3448)	TITLE - RECOVERY OF CARBOANE IN THE MANUFACTURE OF NTC	PROBLEM - THERE IS AN E2 LOSS OF UNREFACTED CARBOANE FROM THE PROCESS USED TO PRODUCE NTC.	440			
		SOLUTION - RECOVER AND RECYCLE THE DIPOANE WITH A DIETHYL-ZINC CHLORIDE PROCESS.				

MAT FIVE YEAR PLAN
RCS DRCHT 126

COMPONENT	-- PROPELLANTS	FUNDING (\$000)					
		PRIOR	\$1	\$2	\$3	\$4	\$5
(CONTINUED)							
(3449) TITLE	-- OPTIONAL PROPELLANT INGREDIENTS	250	431				
PROBLEM - A NUMBER OF CHEMICAL INGREDIENTS USED IN SOLID ROCKET PROPELLANTS HAVE BECOME UNAVAILABLE BECAUSE SOME OF THE REAGENTS ARE HAZARDOUS.							
SOLUTION - STUDIES SHOW THAT ISOPROPONONE DIISOCYANATE (IPDI) CAN BE MADE IN A BATCH PROCESS WITHOUT USING PHOSGENE. THIS LABORATORY PROCESS WILL BE SCALED UP.							
(3456) TITLE	-- SCALE UP & DEMONSTRATION OF A PROCESS FOR DIEORANE	950					
PROBLEM - THE PRESENT PROCESS IS A BATCH OPERATION AND BECAUSE OF THE DIFFICULTY IN CONTROLLING THE CHEMISTRY THE BATCHES ARE SMALL RESULTING IN HIGH LABOR COSTS.							
SOLUTION - IT IS ESTIMATED THAT DIEORANE CAN BE PRODUCED USING INEXPENSIVE RAW MATERIALS- BORIC ACID, METHANOL AND SODIUM HYDRODE IN A SIMPLE CONTINUOUS PROCESS THAT IS EASILY CONTROLLED. A PILOT FACILITY WILL BE BUILT TO DEVELOP THE PROCESSES.							
***** * C A T E G O R Y * *-----* * TEST EQUIPMENT * *-----* ***** 							
COMPONENT	-- ELECTRICAL TEST EQUIPMENT						
(3115) TITLE	-- ENGINEERING FOR CALIBRATION EQUIPMENT	3787	661	800	800	800	800
PROBLEM - MEASUREMENT SCIENCES OR METROLOGY MUST BE CONTINUALLY ADVANCED IN RELEVANT TECHNOLOGY AREAS TO KEEP PACE WITH MANY ARMY PROGRAMS.							
SOLUTION - ADVANCEMENTS MUST BE MADE BY DERIVING NEW TYPES OF STANDARDS.							
COMPONENT	-- ELECTRONIC COMPONENTS						
(106C) TITLE	-- ELECTRICAL TEST AND SCREENING OF CHIPS	375	4:1				
PROBLEM - ONE UNRELIABLE CHIP IN MILITARY ELECTRONIC ASSEMBLIES CAUSES REJECTION OR DESTRUCTION OF THE ENTIRE PACKAGE. PRESENT MEANS FOR DETERMINING CHIP RELIABILITY OR INTEGRITY IS A PROBE TESTING TECHNIQUE WHICH IS TIME CONSUMING AND DESTRUCTIVE.							
SOLUTION - PLACE A MONOLITHIC CHIP TESTING DEVICE AT THE POINT JUST BEFORE THE CHIP IS BONDED TO THE SUBSTRATE. INCLUDE ON THE PROBE A NON-DESTRUCTIVE POINT AND A METHOD FOR OXIDE REMOVAL.							

MMT FIVE YEAR PLAN
HCS CRCT 126

FUNDING (\$000)

COMPONENT	TITLE	PRIOR	81	82	83	84	85
(CONTINUE(1))							
(1076) COMPONENT -- ELECTRONIC COMPONENTS	(1076) TITLE - AUTOMATIC RECOGNITION OF CHIPS						
	PROBLEM - INABILITY TO RECOGNIZE THE TOPOGRAPHY OF MORE THAN SIX TO SEVEN CHIPS ON A HYBRID SUBSTRATE. MILITARY HYBRID CIRCUITS CARRY TEN TO FIFTEEN TYPE ACTIVE COMPONENTS.		550	481	430		
	SOLUTION - MODIFY EXISTING OPTICAL PATTERN RECOGNITION EQUIPMENT FOR COMPONENT AND BOARD ALIGNMENT TO RECOGNIZE AN AVERAGE 30 TO 35 DIFFERENT DEVICES PER SUBSTRATE.	250					
(1077) COMPONENT -- ELECTRONIC COMPONENTS	(1077) TITLE - AUTOMATIC TESTING OF SUBSTRATES						
	PROBLEM - MULTILAYER HYBRID SUBSTRATE TEST METHODS ARE MECHANICAL, USING A MICROFINE PROBE. THE TEST METHOD IS TECHNICALLY DIFFICULT, TIME CONSUMING AND CONTRIBUTES TO YIELD LOSS.						
	SOLUTION - ESTABLISH A PROCESS USING AN ELECTRON BEAM SCANNER. USE COMPUTER-AIDED DEVICES AND A COMPLETE SCANNING SYSTEM WITH A EFFECT LIBRARY DEVELOPED TO INCREASE YIELD IN SUBSTRATE FABRICATION.						
(3201) COMPONENT -- INFRARED ELEMENT TESTING	(3201) TITLE - HIGH TEMPERATURE OPERATING TESTS FOR MICROCIRCUITS						
	PROBLEM - LIFE TESTS ON SEMICONDUCTOR DEVICES ARE IMRACTICAL DUE TO THE HUNDREDS OF THOUSANDS OF TEST HOURS REQUIRED.						
	SOLUTION - IMPLEMENT HIGH TEMPERATURE OPERATING TESTS AS EARLY IN THE MANUFACTURING CYCLE AS FEASIBLE.						
(3302) COMPONENT -- INFRARED ELEMENT TESTING	(3302) TITLE - INFRARED ELEMENT TESTING						
	PROBLEM - IR SYSTEM OPTICAL ELEMENTS ARE SPECIFIED IN TERMS OF MIL-0-13630 WHICH REQUIRES SUBJECTIVE JUDGEMENT.						
	SOLUTION - ESTABLISH A SUPPLEMENT TO MIL-0-13630, OPTICAL DESIGN GUIDANCE FOR FUNCTION TESTING, STANDARD TESTS AND EQUIPMENT.						
COMPONENT -- GENERAL							
(1078) COMPONENT -- ACOUSTIC EMISSION	(1078) TITLE - ACOUSTIC EMISSION OF MOLT CASE WELD FABRICATION						
	PROBLEM - FABRICATION OF ROCKET WELDING CLASSES BY ROLL AND WELD PROCESS IS UNATTRACTIVE BECAUSE OF HIGH COST FROM EXTENSIVE NON-DESTRUCTIVE INSPECTION TECHNIQUES REQUIRED. A TECHNIQUE IS TO DETECT EFFECTS AS THEY FORM THUS PERMITTING IMMEDIATE REPAIR.						
	SOLUTION - DEVELOP AN ON-LINE, REAL TIME ACOUSTIC EMISSION WELD MONITORING TECHNIQUE. THIS PROJECT WILL EXTRNE THE RESULTS OF AN MTT PROJECT TO THE FULL FABRICATION CONFIGURATION.						

MMT FIVE YEAR PLAN
RCS DRCT 126

COMPONENT -- GENERAL
(1074) TITLE - CHEMICAL CHARACTERIZATION PX SPECTROSCOPY
FUNDING (4000)

PRIOR -----
FUNDING (4000)

(CONTINUED)

PROBLEM - INFRARED ANALYSIS OF COMPOSITE RESIN CONSTITUENTS SEPARATED BY HIGH PRESSURE LIQUID CHROMATOGRAPHY (HPLC) IS LABOR INTENSIVE, AND THUS EXPENSIVE.
SOLUTION - AUTOMATE THE COLLECTION, PREPARATION, AND INFRARED ANALYSIS OF RESIN CONSTITUENTS SEPARATED BY HPLC.

COMPONENT -- X-RAY AND N-RAY
(3241) TITLE - AUTOMATIC X-RAY READER TEST EQUIPMENT FOR 3D X-RAYS

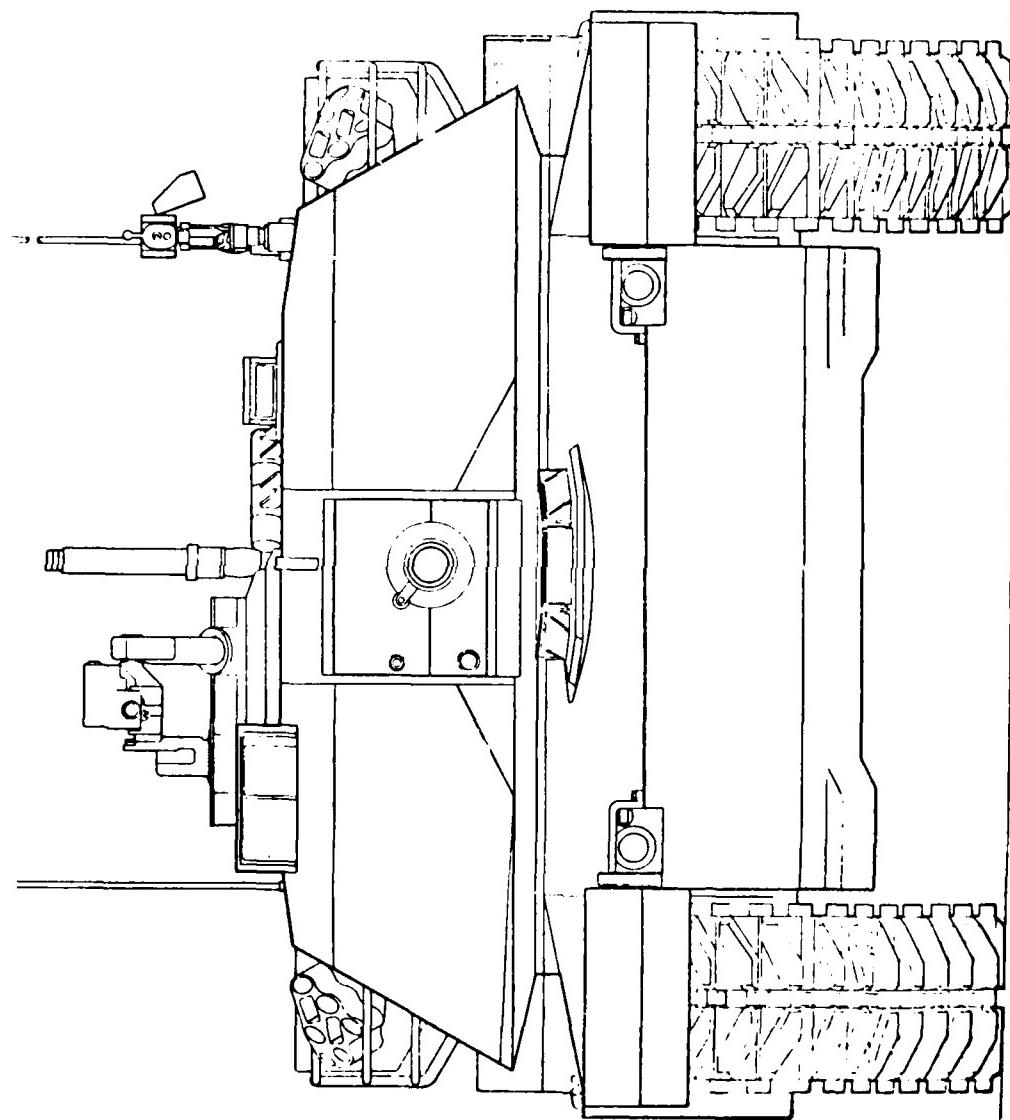
PROBLEM - X-RAY IS LIMITED TO A TWO DIMENSIONAL FORMAT AND IS DEPENDENT ON THE TRAINING AND JUDGEMENT OF THE INSPECTOR.

SOLUTION - AUTOMATE THE ANALYSIS OF X-RAY RESULTS, AND PROVIDE DEPTH PERSPECTIVE BY PARALLEL OR HOLLOWGRAPHIC TECHNIQUES

200

552

**TANK-AUTOMOTIVE COMMAND
(TACOM)**



<u>CATEGORY</u>	<u>PAGE</u>
Armor-----	210
Body Frame-----	212
Drive Systems-----	215
General-----	218
Suspension System-----	221
Track-----	223

US ARMY TANK-AUTOMOTIVE COMMAND

(TACOM)

The US Army Tank and Automotive Command is located in Warren, MI, and has the mission of developing, acquiring, and fielding tracked and wheeled military combat, tactical, and general purpose vehicles. The mission is worldwide in scope and includes among its customers all of the US military services, and friendly foreign nations. The production base for mission items is made up of both private and government-owned contractor-operated facilities. MMT efforts are accomplished partially in-house and partially out-of-house. The TACOM MMT program is separated into six categories: armor, general, drive system, track, suspension, and vehicle body.

The main requirements in the field of armor are to increase the ballistic tolerance of conventional armor while reducing its overall weight, and develop new lightweight armor for the high speed, high survivability vehicles which are currently being evaluated in field tests. To meet these requirements, the Command is emphasizing Electro-Slag Remelt (ESR) steel armor, combination type armor and the application of spall suppressive armor to the interior walls of combat vehicles to reduce the overall ballistic threat. To pursue these new armor developments, it will be necessary to have commercially available joining processes so that these new armors can be used cost effectively in production. TACOM has established several MMT projects covering joining ESR steel armor, welding complex alloys and shapes by laser, identifying electron beam welding applications, and optimizing both welding procedures and ultrasonic inspection of welds.

In general support of combat and tactical vehicles, TACOM is actively pursuing manufacturing technology in various areas. Projects are included for non-corrosive materials, chemical joining techniques, use of advanced microprocessors and multiplexing, high speed machining, and flexible machining pilot lines for batch production. Several projects are also proposed for the CAM area; these include a new machinery and equipment data base, computer simulation of production, application of adaptive control technology to vehicle components, and extension of CAD/CAM principles to spare parts manufacture.

The major requirements for propulsion and track are to develop production techniques to manufacture propulsion and drive systems for the M1 and future tracked and non-tracked combat and tactical vehicles. Fabrication and joining are of major concern. TACOM is actively pursuing production development of advanced casting techniques for integrally cast compressors, automated assembly line welding techniques, compliant joints to join metals and non-metals, and automated laser machining of complex machine alloys. Life cycle costs for various tactical and combat vehicles can be significantly decreased by eliminating premature failure or extending service life of components by reducing corrosion and deterioration. To support this area, TACOM is endeavoring to bring on line ceramic reinforced combustors.

The track and suspension category is constantly caught in the technical dilemma of producing more advanced systems to meet the ever increasing demands of higher performance in more adverse terrains while maintaining the overall reliability and maintainability of the system at or near current system costs. To achieve these objectives, the track area, as with the other categories, has been sub-divided into major thrust areas for better visibility and management control. These areas are general, rubber pads, shoes, track sprockets, wedges and suspension components. In these areas the general thrusts have been to introduce production techniques for metal matrix composites, non-metallic matrix composites, advanced rubber compounds, advance elastomeric compounds, lightweight castings, hard surface coatings and powder metallurgy.

In body/frame, the main thrusts are the conservation of fuel and material. To meet these requirements the objective is to reduce the overall weight of the vehicle, to increase its payload, and lower the life cycle cost of the systems by reducing the corrosion and degradation of the materials of construction. Here the main areas of concern are coatings, lightweight/composite structures, miscellaneous components, structural members, suspension systems, and seats and fuel tanks. Within these areas, work will be accomplished in elastic reservoir molding of reinforced trailer module bodies to reduce weight and costs, rapid curing automotive paints, new fungicidal paints, automated and computer controlled processes for joining metals with adhesives, plastic cab tops, maintenance free batteries with high impact resistance, and non-corrosive, lightweight non-structural tactical vehicle components.

TACOM
COMMAND FUNDING SUMMARY
(Thousands)

CATEGORY	FY81	FY82	FY83	FY84	FY85
ARMOR	3177	7725	11082	12415	13025
BODY/FRAME	1158	327	970	1750	1200
DRIVE SYSTEM	360	2665	4960	5720	6517
GENERAL	1159	3730	5900	6250	6400
SUSPENSION SYSTEM	497	825	600	1620	1325
TRACK	500	650	1186	815	725
TOTAL	6851	15922?	24698	28570	29192

PROBLEM		SOLUTION		FUNDING (\$1000)			
TITLE	PROBLEM	SOLUTION	PRIO/P	E1	E2	E4	E5
GENERAL							
(4477) TITLE - ATTACHMENT OR CUSHIONING, SPARE TO COMBAT VEHICLES	PROBLEM - COMBINATION DEVICE SYSTEMS PROVIDE LARGE PALLIATRIC IMPROVEMENT BUT REQUIRE COMPLEX ATTACHMENT MECHANISMS.	SOLUTION - IDENTIFY COST-EFFECTIVE METHODS FOR PRODUCTION APPLICATION.	PRIO/P	250	250	250	250
(4478) TITLE - ELECTRON FLAW WELDING FOR FERROUS MATERIALS MODIFICATION	PROBLEM - ELECTRON FLAW WELDING FOR FERROUS MATERIALS REQUIRES MODIFICATION TO ASSURE HIGH QUALITY.	SOLUTION - IDENTIFY LOW-COST AUTOMATIC TECHNIQUES FOR APPLICATION OF ELECTRON FLAW WELDING ON FERROUS MATERIALS.	PRIO/P	375	375	375	375
(4479) TITLE - IMPROVED SOLIDIFICATION AND SMOOTH THICK ARMOR CASTING	PROBLEM - PRESENT CASTING TECHNIQUES NEED UPDATING IN ORDER TO EXPLOIT THE ADVANTAGE OF CASTING PROCESS.	SOLUTION - ESTABLISH IN PRODUCTION TECHNIQUES FOR CONTROLLING SOLIDIFICATION RATES IN METALS TO IMPROVE PROPERTIES AND REDUCE COSTS.	PRIO/P	762	731	731	731
(4480) TITLE - ADVANCED TECHNOLOGY SURVEILLANCE COUNTERMEASURES MATERIALS	PROBLEM - USE OF MATERIALS WHICH WILL DEFEND SURVEILLANCE MEASURES HAS NOT BEEN EXPLOITED IN PRODUCTION.	SOLUTION - PRODUCTION TECHNIQUES ARE REFINED TO ASSURE SUFFICIENT QUALITY TO PERFORM SATISFACTORILY.	PRIO/P	100	250	250	250
(4481) TITLE - HIGH-POWER ELECTRON BEAM WELDING IN AIR	PROBLEM - USE OF ELECTRON BEAM HAS NOT BEEN EXPLICATED.	SOLUTION - ESTABLISH PROCEDURES UTILIZING THIS NEW PROCESS FOR RAPID ECONOMICAL JOINING OF ARMOR MATERIALS.	PRIO/P	45	300	300	300
(4482) TITLE - ALLOY AND ARMOR STEELS TREATED WITH RARE EARTH ADDITIVES	PROBLEM - ARMOR STEELS UTILIZED CONVENTIONAL FLAMMING AND SCAVENGING PROCESSES IN STEEL MAKING.	SOLUTION - ESTABLISH TECHNIQUES TO TREAT STEELS WITH RARE EARTH ADDITIONS.	PRIO/P	48	500	500	500
(4483) TITLE - POLYMER COMPOSITES	PROBLEM - THE PRESENT USE OF OIL AS THE QUENCHING MEDIUM IN HEAT TREAT PLANTS INCREASES THE FREQUENCY OF CATCH FIRES, AND IT LIMITS CONSIDERABLE AMOUNTS OF SHORT AND FLAMES.	SOLUTION - EXPAND THE USE OF WATER-MILITARY POLYMERS AS A QUENCHANT TO AVOID FIRE AND POLLUTION PROBLEMS.	PRIO/P	150	150	150	150

MAT FIVE YEAR PLAN
RCS DRCP 126

COMPONENT -- GENERAL

(CONTINUED)

(607) TITLE - HIGH DEPOSITION WELDING PROCESSES FOR ARMOR

PROBLEM - WELDING IS LABOR INTENSIVE AND HIGH COST IT IS A MAJOR COST DRIVER IN ARMOR VEHICLE MANUFACTURE.

SOLUTION - HIGH DEPOSITION WELDING PROCESSES WILL PERMIT WELDING TO BE ACCOMPLISHED MORE RAPIDLY THUS REDUCING MANPOWER REQUIREMENTS AND INCREASING PRODUCTIVITY.

(608) TITLE - XM-1 COMBAT VEHICLE-MFG TECHNOLOGY

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE XM-1 CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE XM-1 TO BE MANUFACTURED MORE ECONOMICALLY.

SOLUTION - IMPROVE PROCESSES FOR XM-1 VFC. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, HI-CAST HP TURBINE NOZZLES, RSR NICKEL BASE SUPER ALLOYS, MONOCRYSTAL ALLOYS, CERAMIC COMBUSTORS, THERMALLY ASSISTED MACHINING, ETC.

(609) TITLE - FVS COMBAT VEHICLE-MFG TECHNOLOGY

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.

SOLUTION - IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTNRS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.

COMPONENT -- HULL/BODY

(610) TITLE - PROVIDE PROTOTYP ROBOTS FOR AUTOMATED BLAST CLEANING

PROBLEM - HULLS OF VEHICLES ARE BLAST CLEANED TO REMOVE OIL, PAINT AND RUST PRIOR TO PAINTING. THE CURRENT METHOD IS MANUAL, LABOR INTENSIVE, TIME CONSUMING, AND CREATES AN UNHEALTHY SITUATION FOR THE WORKERS.

SOLUTION - A FASTER, MORE PRODUCTIVE, AND MORE PRECISE BLAST CLEANING OPERATION WILL BE DEVELOPED USING INDUSTRIAL ROBOTS. A ROBOT SYSTEM USING THREE ROBOTS CONCURRENTLY WILL BE DESIGNED, INSTALLED, DEBUGGED, AND PROVEN OUT.

(611) TITLE - JOINING DISSIMILAR METALS

PROBLEM - CURRENT ARMED FORCES USE ONLY ONE TYPE OF METAL FOR WELDING.

SOLUTION - BI-METAL JOINTS WILL BE INVESTIGATED. COMBINATION MECHANICAL AND WELD JOINTS WILL ALSO BE STUDIED.

FUNDING (\$000)

COMPONENT	TITLE	PRIOR	81	82	83	84	85
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PRIOR	81	82	83	84	85
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FUNDING (\$000)

278

F5

CONTRACT - MULLER, GUY

(CONTINUED)

1514) TITLE - FOUNDRY CASTING PROCESSES USING FLUID FLOW + THERM ANALYS

PROBLEM - FOUNDRY CASTING PROCESSES ARE WASTEFUL OF RAW MATERIALS AND ENERGY.

SOLUTION - OPTIMIZE CASTING PROCESSES BY DIGITAL COMPUTER ANALYSIS OF ADVANCED FLUID FLOW AND THERMAL ACTIVITY.

1515) TITLE - HEAVY ALUMINUM PLATE FABRICATION

PROBLEM - MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIED CONTOURS AND WELDING THE FLICES TOGETHER REQUIRES A GREAT DEAL OF ANUAL LABOR.

SOLUTION - ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROLS. PROCESS PARAMETERS WILL BE ESTABLISHED FOR HIGH DISPOSITION WELDING PROCESSES.

1516) TITLE - WELDING SYSTEMS INTEGRATION

PROBLEM - OF ALL METAL WORKING PROCESSES EMPLOYED IN TRACKED COMBAT VEHICLES MANUFACTURING WELDING IS THE MOST LABOR INTENSIVE AND AFTER MACHINING, THE MOST COSTLY. AUTOMATION WHICH COULD REDUCE THESE COSTS IS AS YET AN UNACHIEVED GOAL.

SOLUTION - UNDERTAKE A COORDINATED PROGRAM TO INTEGRATE EXISTING EXPERTISE AND TECHNOLOGY TO ADDRESS ONE APPLICATION (THE HULL). EXPERTISE WILL BE IN AREA OF WELDING PROCESS CONTROL, SENSORY TECHNOLOGY, STRESS ANALYSIS, AND COMPUTER CONTROL.

1517) TITLE - PERMANENT SPLIT MOLD FOR NET SHAPE STEEL CASTINGS

PROBLEM - MANY PARTS, UNIQUE TO THE ARMY NEEDS, ARE FORGINGS WHICH REQUIRE EXPENSIVE AND EXTENSIVE MACHINING TO FINISH.

SOLUTION - PERMANENT MOLD CASTING PROCESS IS ABLE TO PRODUCE CLOSE TOLERANCES, THEREFORE REDUCING OR ELIMINATING MANY COSTLY FINISHING OPERATIONS.

1518) TITLE - ADAPTATION AND AUTOMATION OF ACOUSTIC EMISSION WELD MONITORING

PROBLEM - IN PROCESSES OF HEAVY WELDING SUCH AS WITH ARMOR, RADIOGRAPHIC INSPECTION METHODS ARE COSTLY BUT NOT TOTALLY RELIABLE

SOLUTION - ACOUSTIC SENSORS, USED WITH THE WELDING EQUIPMENT, MONITOR WELD QUALITY AS THE WELD IS MADE. DEFECTS MAY BE MADE IMMEDIATELY.

* C A T E G O R Y *
* RADAR/EKFMF *

MMI FIVE YEAR PLAN
RCS DRCP 126

FUNDING (\$000's)

COMPONENT	TITLE	PRIOR	E1	E2	E3	E4	E5
COMPONENT -- COATING							
(5547) TITLE - ENVIRONMENTAL COLOR ADAPTING COATINGS FOR COMBAT VEHICLES	PROBLEM - ARMY VEHICLE COLORS DO NOT BLEND WITH EVERY TERRAIN AND/OR ENVIRONMENTAL CONDITION.	150					
SOLUTION - ESTABLISH PROCESS FOR APPLICATION OF COATINGS WHICH WILL CHANGE COLOR TO BLEND INTO ANY ENVIRONMENT.							
(5615) TITLE - NEW ANTI-CORROSION MATERIALS AND TECHNIQUES	PROBLEM - METALLIC COMPONENTS ARE DETERIORATED BY THE ENVIRONMENT.	30	300	150	150	100	
SOLUTION - ESTABLISH TECHNIQUES OF ECONOMICALLY APPLYING ANTI-CORROSIVE MATERIAL COATINGS TO THE COMPONENTS OF THE TACTICAL VEHICLE FLEET.							
(6012) TITLE - PRODUCTION TECHNIQUES FOR THE APPLICATION NEW NONTOXIC PAINT	PROBLEM - THE OLD PAINT WITH METAL ANTI-FUNGICIDES HAVE BEEN DISAPPROVED BY THE FDA.	100	250	250	250		
SOLUTION - DEVELOP NEW METHODS FOR APPLYING THE NEWLY DEVELOPED PAINTS.							
COMPONENT -- FUEL TANKS							
(6071) TITLE - PASSIVE EXPLOSION SUPPRESSION SYSTEM	PROBLEM - FUEL CONTAINERS IN A VEHICLE ARE A CRITICAL HAZARD IF ENEMY FIRE HITS THE VEHICLE. SERIOUS FIRES CAN RESULT.	300					
SOLUTION - TECHNOLOGY HAS PROVIDED SEVERAL POSSIBLE ANSWERS TO THIS PROBLEM. AND THESE WILL BE EVALUATED AND APPLIED AS A SOLUTION.							
COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES							
(5619) TITLE - INSULATED PLASTIC ENVIRONMENTAL TRAILER MODULES (TERM)	PROBLEM - MINIMUM EFFORT WAS EXERTED TO DEVELOP TECHNIQUES TO UTILIZE ALL PLASTIC, NON-STRUCTURAL VEHICLE FODIES.	200	300				
SOLUTION - ESTABLISH THE FEASIBILITY OF USING ELASTIC RESERVOIR MOLDING REINFORCED BODIES FOR TRAILER MODULES.							
(5542) TITLE - MANUFACTURING TECHNIQUES FOR NON-METALLIC TOTAL VEHICLES	PROBLEM - CURRENT VEHICLE COMPONENTS ARE MADE FROM METALS AND ARE EXCESSIVE IN WEIGHT AND TEND TO CORRODE. NEW NON-METALLIC MATERIALS ARE AVAILABLE AND COULD BE ADAPTED.	300	250				
SOLUTION - VALIDATE FEASIBILITY OF MOLDING VEHICLE COMPONENTS FROM NON-METALLIC MATERIAL USING A MINIMUM OF PARTS AND ESTABLISH PRODUCTION TECHNIQUES.							

MAT FIVE YEAR PLAN
RCS ORCHT 12F

FUNDING (\$000)

	PRIOR	81	82	83	84	85
<hr/>						
COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES	(CONTINUED)					
(6360) TITLE - LIGHTWEIGHT TILT-UP HOOD/FENDER ASSEMBLY		200	200			
PROBLEM - CURRENT HOOD/FENDER ASSEMBLY MADE FROM STEEL STAMPINGS ARE TOO HEAVY FOR ONE MAN TO LIFT.						
SOLUTION - REDUCE WEIGHT BY MANUFACTURING ITEMS FROM LIGHTWEIGHT FORMABLE PLASTIC.		250				
(636b) TITLE - EXPLOSIVE BONDING OF COMPOSITE MATERIALS		300				
PROBLEM - REQUIREMENTS TO BOND ALTERNATE FLIES OF STEEL AND ALUMINUM MAY BE MET ONLY BY CUMBERSOME, EXPENSIVE AND SLOW PROCESSES.						
SOLUTION - EXPLOSIVE BONDING BONDS STEEL AND ALUMINUM QUICKLY, RELIABLY, AND CAN BE APPLIED TO ARMOR FABRICATION.						
COMPONENT -- MISC COMPONENTS						
(5019) TITLE - TACTICAL VEHICLE STORAGE BATTERY		329	160			
PROBLEM - THE MAJOR CAUSE OF TACTICAL VEHICLE BATTERY FAILURE IS BATTERY CONTAINER BREAKAGE.						
SOLUTION - PROVIDE NEW HIGH IMPACT PLASTIC CONTAINER TO INCREASE FIELD PERFORMANCE REQUIREMENTS AND TO ACCOMMODATE THE MAINTENANCE FREE CONCEPT ALREADY REFLASFD IN LARGER MILITARY BATTERY SIZES.						
(5069) TITLE - THREADED FASTENER-LOCKING ADHESIVES AND SEALANTS		120				
PROBLEM - VIBRATION AND SHOCK IN MILITARY VEHICLE OPERATION DEFEATS MANY OF THE MOST EFFICIENT LOCKING MEANS FOR THREADED FAST-NERS.						
SOLUTION - DETERMINE AND APPLY OPTIMIZED AVAILABLE THREADED SEALING COMPONENTS FOR USE IN VEHICLE MANUFACTURE.						
(6664) TITLE - ADHESIVES FOR TACTICAL VEHICLE ATTACHMENTS		250				
PROBLEM - THE FEASIBILITY OF USING ADHESIVES IN PLACE OF WELDING HAS BEEN ESTABLISHED, BUT WORK NEEDS TO BE DONE TO ESTABLISH OPTIMUM ADHESIVES AND CONDITIONS FOR ITS APPLICATION IN THE PRODUCTION ENVIRONMENT.						
SOLUTION - ESTABLISH A PROCESS FOR APPLYING ADHESIVE BONDING TO THE ATTACHMENT OF ITEMS TO ARMORED VEHICLES.		300	200			

FUNDING (\$000)

COMPONENT	~	STRUCTURAL MEMBERS	PRIOR	F1	F2	F3	F4	F5	1000
14579	TITLE -	INDUSTRIAL PRACTICES FOR WELDING CONSTRUCTIONAL ALLOY STEELS							
	PROBLEM -	A WIDE VARIETY OF HIGH STRENGTH CONSTRUCTIONAL ALLOYS STILL WILL BE USED IN GREATER QUANTITIES TO MEET WEIGHT REQUIREMENTS.							
	SOLUTION -	DOCUMENT RECOMMENDED WELDING PRACTICES AND PROCEDURES TO IDENTIFY SIGNIFICANT FACTORS AFFECTING PRODUCTION QUALITY FOR THE VARIOUS MATERIALS AND EQUIPMENT.							
16067	TITLE -	AUTOMATED PROTOTYPE FRAME WELDING		77	77				
	PROBLEM -	THE WELDING OF SPECIALIZED TRUCK AND TRAILER FRAMES BY THE MANUAL METHOD IS TIME CONSUMING AND COSTLY.							
	SOLUTION -	ESTABLISH A UNIVERSAL FIXTURE THAT WILL USE AUTOMATIC WELDING PROCEDURES.							
	COMPONENT	~	SUSPENSION SYSTEM						
215	(4002)	TITLE -	ROBOTIZED WELDING OF M113A2 SUSPENSION						421
	PROBLEM -	THE CURRENT METHOD OF WELDING THE M113A2 SUSPENSION SYSTEM IS TIME CONSUMING AND LABOR INTENSIVE.							
	SOLUTION -	ROBOTIZE THE WELDING OPERATION TO REDUCE MAN HOURS FROM ELEVEN TO SIX FOR A LABOR SAVING OF 58 DOLLARS PER HULL.							
	*****	*****	*****						
	* C A T E G O R Y *	*****	*****						
	-----	-----*	-----*						
	DRIVE SYSTEM	*****	*****						
	*****	*****	*****						
	COMPONENT	~	ENGINE						
	(TT13)	TITLE -	XH1 COMBAT VEHICLE-AGT1500 TURBINE ENGINE						
	PROBLEM -	THE NEED TO REDUCE COST (PRODUCTION AND LIFE CYCLE COSTS) AND IMPROVE PERFORMANCE OF THE ENGINE REQUIRES THE USE OF NEWER AND INNOVATIVE TECHNOLOGY.							
	SOLUTION -	NEW PROCESSES AND TECHNOLOGIES, BETTER HIGH TEMP MATERIALS, AND REDUCED LABOR INTENSIVE MANUFACTURING OPERATIONS WILL ACHIEVE LOWER COSTS, IMPROVED PERFORMANCE AND FUEL EFFICIENCY.							
	2000	4000	6000						

MAT FIVE YEAR PLAN
FCS DRAFT 126

FUNDING (\$000)

COMPONENT -- ENGINE

(CONTINUE(1))

(5053) TITLE - MANUFACTURE OF ENGINE COMPONENTS OF CERAMIC

PROBLEM - FABRICATION OF HIGH EFFICIENCY, HIGH TEMPERATURE DIESEL ENGINES REQUIRES ADVANCED MATERIALS. ENGINES FABRICATED WITH CERAMIC COMPONENTS HAVE BEEN DEMONSTRATED IN R&D BUT MANUFACTURING METHODS FOR SERIAL PRODUCTION COMPONENTS ARE LACKING.

SOLUTION - RECENT RESEARCH EFFORTS INDICATE THAT ENGINE COMPONENTS FROM HIGH STRENGTH STRUCTURAL CERAMICS (SILICON NITRIDE, SILICON CARBIDE) ARE FEASIBLE. THIS EFFORT WILL ESTABLISH QUANTITY PRODUCTION OF CERAMIC COMPONENTS OF CONSISTENT QUALITY.

(5045) TITLE - PROD TECH FOR FAB OF TURBINE ENGINE RECUPERATOR

PROBLEM - CURRENT METHOD REQUIRES A LARGE NUMBER OF WELDS TO FABRICATE COMPONENT.

SOLUTION - ESTABLISH PROCEDURE UTILIZING A LASER BEAM TO GREATLY INCREASE WELDING SPEED.

(5C47) TITLE - INTEGRALLY CAST LOW COST COMPRESSOR

PROBLEM - TURBINE BLADES AND DISCS MUST HAVE ADEQUATE LOW AND HIGH CYCLE FATIGUE PROPERTIES. AXIAL COMPRESSOR STAGES ARE DESIGNED AS SEPARATELY BLADED ASSEMBLIES.

SOLUTION - INTEGRALLY CAST THE AXIAL COMPRESSOR STAGES AND THE CENTRIFUGAL ROTOR TO ELIMINATE MANY COSTLY MACHINING OPERATIONS.

(6C18) TITLE - AUTOMATED COMPUTER CONTROL LASER MACHINING

PROBLEM - CONVENTIONAL MACHINING OF DIFFICULT TO MACHINE MATERIALS IS VERY EXPENSIVE. RAPID TOOL WEAR AND LOCALIZED HEATING OF THE WORKPIECE IMPACT REMOVAL RATES AND METALLURGICAL CHARACTERISTICS.

SOLUTION - THIS PROGRAM WILL DEVELOP TECHNIQUES FOR LASER MACHINING BY NUMERICAL CONTROL.

(6C19) TITLE - JOINING OF ATTACHMENTS TO CERAMICS

PROBLEM - CURRENT METHOD OF JOINING METALS TO CERAMIC JOINTS ARE NOT RELIABLE AND HAVE POOR LIFE.

SOLUTION - INVESTIGATE USE OF JOINTS THAT ARE COMPLIANT OR USE INTERMEDIATE CONNECTING PHASE.

(6C19) TITLE - GRAIN BOUNDARY IMPROVEMENT PROCESSING FOR CERAMICS

PROBLEM - EFFECT OF HIGH TEMPERATURE ON CERAMICS GRAIN BOUNDARIES LIMIT THEIR APPLICATION.

SOLUTION - UPSCALE DEVELOPED TECHNIQUES FOR DEVELOPING A NONGLASS BOUNDARY OR ELIMINATE THE GRAIN BOUNDARY PHASE.

PRIOR F1 F2 F3 F4 F5

100 140

100 120

MMT FIVE YEAR PLAN
RCS DRCPT 126

FUNDING (\$000)

COMPONENT	PRIOR	61	82	83	84	85
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(CONTINUED)

(6020) TITLE - PRODUCTION OF REINFORCED CERAMIC COMBUSTORS

PROBLEM - TECHNIQUE FOR LARGE SCALE PRODUCTION OF COMBUSTORS NOT AVAILABLE.
THESE COMBUSTORS IMPROVE ENGINE PERFORMANCE GREATLY.

SOLUTION - UPSCALE LABORATORY PROVEN TECHNIQUE FOR FABRICATING COMBUSTOR FOR PRODUCTION.

(6028) TITLE - PRODUCTION QUALITY CONTROL BY AUTO INSPECTION EQUIPMENT (CAM)

PROBLEM - THE INCREASED COMPLEXITY OF COMBAT VEHICLES HAS RESULTED IN EXCESSIVE TIME AND HIGH SKILL LEVEL REQUIREMENTS FOR INSPECTION AND TEST.

SOLUTION - DEVELOP AUTOMATED DIAGNOSTIC EQUIPMENT TO REDUCE TIME AND LOWER SKILL REQUIREMENTS. AUTOTESTING OF WIRING HARNESSES AND ENGINES WILL BE ACCOMPLISHED. AUTOMATION OF INSPECTION RECORDS WILL BE ACCOMPLISHED.

(6055) TITLE - PRODUCTION OF IMPROVED ANTI-CORROSION MATERIALS

PROBLEM - TO INCREASE THE EFFICIENCY OF TURBINE ENGINES CREEP RESISTANT NON-CORRODING, HIGH TEMPERATURE STRENGTH MATERIALS ARE REQUIRED. PRESENTLY EXPENSIVE METALLIC SUPERALLOYS AND CERAMICS ARE BEING USED.

SOLUTION - IN MECHANICAL ALLOYING, METAL POWDERS ARE COLD WELDED IN HIGH-ENERGY MILLS. THE PROPERTIES OF THESE ALLOYS ARE SUPERIOR OVERALL TO THE PRESENTLY USED MATERIALS. MANUFACTURING TECHNIQUES FOR MASS PRODUCTION WILL BE ESTABLISHED.

(6056) TITLE - SIMPLIFIED TEST EQUIP FOR INT COMB ENGINES (STE/ICE)

PROBLEM - SUITABLE TRANSDUCERS AND SENSORS ARE NOT READILY AVAILABLE FOR INSTALLATION ON MILITARY VEHICLES FOR BUILT-IN DIAGNOSTICS.

SOLUTION - TRANSDUCERS ARE TO BE DEVELOPED TO FULFILL THE NEEDS FOR DIAGNOSTIC CAPABILITY.

(6072) TITLE - LASER VIBRATION DEPOT INSPECTION SYSTEM

PROBLEM - FOR DEPOT OVERHAUL WORK IN POWER TRAIN COMPONENTS. NO DEVICE IS ON HAND FOR DIAGNOSSING CAUSES OF VIBRATION, AND THE RESULTANT DAMAGE TO ENGINES.

SOLUTION - LASER VIBRATION SENSING DEVICES CAN BE DEVELOPED FOR OVERHAUL INSPECTION DIAGNOSTICS. THEY HAVE BEEN PROVEN IN SIMILAR APPLICATIONS.

COMPONENT -- ENGINE

(7001) TITLE - AUTOMATED DYNAMOMETER CONTROL FOR STANDARDIZED INSP TESTING

PROBLEM - ALL ENGINES ARE TORN DOWN WHILE 20% COULD BE RESTORED TO OPERATION WITHOUT PHYSICAL TEARDOWN. TEARDOWN IS 1/3 COST OF OVERHAUL. ALL ENGINES REBUILD REQUIRE A 4 HOUR DYNAMOMETER OPERATIONAL TEST CYCLE.

SOLUTION - AUTOMATE CURRENT MANUALLY OPERATED DYNAMOMETER TEST CELLS ALLOWING PRE-SHOP INSPECTION WITHOUT TEARDOWN AND REDUCING REBUILD ENGINE RUN-IN TIME BY EIGHTY PERCENT.

COMPONENT -- TRANSMISSION

(5005) TITLE - COLD FORGED GEARS TO DRAWING TOLERANCES

PROBLEM - MACHINING AND OTHER PROCESSES AND COST TO THE FINISHED COMPONENT.

SOLUTION - ESTABLISH A MFG PROCESS TO RESULT IN A FINISHED GEAR TO DRAWING TOLERANCES FROM BAR STOCK AT AMBIENT TEMPERATURES.

(5024) TITLE - GEAR DIE DESIGN AND MFG UTILIZING COMPUTER TECHNOLOGY (CAM)

PROBLEM - THE CONTROL OF DIMENSIONAL TOLERANCES OF FORGED BEVEL GEARS PRESENTS A UNIQUE PROBLEM SINCE THESE GEARS ARE NOT MFG. IN THEORETICAL EQUATIONS. THE BEVEL GEAR IS NOT DEFINED DIMENSIONALLY BUT IS PRESENTED AS REQUIREMENTS FOR TOOTH SPACING PATTERNS.

SOLUTION - THIS PROGRAM WILL ELIMINATE THE CURRENT TRIAL AND ERROR METHODS BY UTILIZING CAD/CAM METHODS AND INFRATEK. AND THE HIGH COST OF FORGING DIES WILL BE ADDRESSED.

(50r3) TITLE - UPSCALING OF ADVANCED POWDER METALLURGY PROCESSES

PROBLEM - POWDER METALS PROCESSES HAVE NOT BEEN UTILIZED IN LARGE COMPONENTS

SOLUTION - EST PROCESSES WHICH PRODUCE HIGH DENSITY HIGH STRENGTH LARGE COMPLEX SHAPES.

(50r6) TITLE - SURFACE HARDENING AND ALLOYING OF TRANS SYSTEMS WITH LASERS

PROBLEM - FLAME AND INDUCTION HARDENING IS EMPLOYED TO SURFACE HARDEN VEHICLE TRANSMISSION PARTS. THESE PROCESSES ARE INEFFICIENT.

SOLUTION - ESTABLISH PARAMETERS AND CONTROLS NEEDED FOR LASER SURFACE HARDENING

* C A T F G O R Y *

GENERAL

MMT FIVE YEAR PLAN
KCS DRCPT 126

COMPONENT	TITLE	FUNDING (\$1000)				
		PRIOR	E1	E2	E3	E4
(1111) MISCELLANEOUS		65				
(1111) TITLE - MANUFACTURING TECHNOLOGY-AFMY DEPOTS						
PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE REBUILD FUNCTIONS OF THE DEPOTS CAN BE IMPROVED AND MADE MORE EFFICIENT BY INCORPORATING NEW TECHNOLOGIES		1500	2000	3400		
SOLUTION - INTRODUCE NEWER STATE-OF-THE-ART METHODS OF MANUFACTURING INTO DEPOT OPERATIONS.						
(1112) TITLE - SURFACE TREATMENT OF COMPCNETS.		300	300	400		
PROBLEM - PERFORMANCE OF MANY ITEMS IS DEPENDENT ON ITS SURFACE CONDITION. NEW METHODS OF ALTERING SURFACES ARE NOT BEING EMPLOYED.						
SOLUTION - ESTABLISH TECHNIQUES FOR ALTERING MATERIAL SURFACE CONDITIONS SO AS TO IMPROVE PERFORMANCE AND/OR REDUCE COST		100	100			
(1113) TITLE - MOLDED PLASTIC ORDNANCE ELECTRICAL CONNECTOR						
PROBLEM - METALLIC SHELL ELECTRICAL CONNECTORS ARE COSTLY AND SUSCEPTIBLE TO CORROSION AND OTHER PROBLEMS.						
SOLUTION - DEVELOP A MEANS OF MANUFACTURING CONNECTORS WITH PLASTIC REFLACING METAL SHELLS.						
(1114) TITLE - IMPROVED HIGH STRENGTH ALUMINUM COMPONENTS		200	200	250		
PROBLEM - COMMERCIALLY AVAILABLE HIGH STRENGTH ALUMINUM ALLOYS NEED IMPROVEMENT IN DUCTILITY AND FRACTURE TOUGHNESS.						
SOLUTION - ESTABLISH PRODUCTION PROCESSES UTILIZING ADVANCES IN BOTH METAL SOLIDIFICATION AND THERMAL MECHANICAL WORKING OF ALUMINUM ALLOYS.						
(1115) TITLE - FLEXIBLE MACHINING SYSTEM PILOT LINE FOR TCV COMPONENT		155	779	750	500	200
PROBLEM - PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDM TECHNOLOGIES THAT RESULT IN LOWER FDN COSTS ARE NOT USED.						
SOLUTION - THE ADVANTAGES OF MASS FDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIAL.						
(1116) TITLE - IMPROVED AND COST EFFECTIVE MACHINING TECHNOLOGY		600	30	150		150
PROBLEM - MACHINE DATA FOR NEWER MATERIALS AND NEW REMOVAL RATES ARE NOT ESTABLISHED.						
SOLUTION - ESTABLISH THAT WHETHER THE NEW MACHINING EQUIPMENT MAY BE UTILIZED WITH VARIOUS EFFICIENCY.						

COMPONENT	TITLE	PROBLEM	SOLUTION	FUNDING
COMPONENT -- MISCELLANEOUS	(6005) TITLE - MANUFACTURING METHODS FOR HIGH SPEED MACHINING FERROUS ALLOY	PROBLEM - FAST CHIP REMOVAL FOR FERROUS ALLOYS HAVE NOT BEEN ESTABLISHED FOR PRODUCTION.	SOLUTION - ESTABLISH FAST CHIP REMOVAL FOR PRODUCTION CONDITIONS.	450 550 500 300
	(6014) TITLE - AUTOMATED PRODUCTION OF UTILIZING NETWORKS FOR COMBAT VEH	PROBLEM - ADVANCED TECHNIQUES FOR ELECTRICAL POWER DISTRIBUTION AND VEHICLE CONTROL WILL USE ADVANCED MICROPROCESSORS AND MULTILEVELING AND INTRODUCE NEW AND NEW ASSEMBLY TECHNIQUE.	SOLUTION - COMPUTER AIDED DESIGN AND MANUFACTURING WILL BE APPLIED TO ASSEMBLY OF THE COMPLEX ELECTRONIC SYSTEMS.	200 200
	(6025) TITLE - MANUFACTURING LASER FACILITY	PROBLEM - THE FEASIBILITY OF USING LASERS FOR METAL PROCESSING IS ESTABLISHED. IMPLEMENTATION IS IMPRESSED BY THE COST OF FACILITIZATION.	SOLUTION - ESTABLISH A FACILITY TO IMPLEMENT LASER TECHNOLOGY IN PRODUCTION.	1000 1000 1000
	(6035) TITLE - COMPUTER SIMULATION OF TCV MANUFACTURING PROCESSES	PROBLEM - THE LONG LEAD TIMES REQUIRED IN THE MATERIAL ACQUISITION PROCESS OF TRACKED COMBAT VEHICLES (TCV) DO NOT ALLOW COMPONENTS TO REFLECT THE LATEST TECHNOLOGIES. THIS LEADS TO DELAYS AND EXCESSIVE COSTS.	SOLUTION - SIMULATING THE MANUFACTURING PROCESS DURING THE VEHICLE DEVELOPMENT PHASE WILL IDENTIFY TOOLING, OPTIMUM MANUFACTURING PROCESSES, OPTIMUM PRODUCTION LINE, AND POTENTIAL PRODUCTION PROBLEMS. IT WILL ASSIST INNOVATION AND PROVIDE FOR ACCURATE PLANNING.	300 250 250 250
	(6041) TITLE - APPLICATION OF ADAPTIVE CONTROL	PROBLEM - SENSORS WHICH RECOGNIZE AND SIGNAL PHENOMENAL CHANGES HAVE BEEN DEVELOPED AND DEMONSTRATED. APPLICATION OF THESE TO ADAPTIVE CONTROL CAN ADVANCE AUTOMATION TO THE LEVEL OF "PUSH BUTTON" FACTORIES. BUT LITTLE OR NOTHING HAS BEEN DONE IN THIS AREA.	SOLUTION - STATE-OF-THE-ART SENSORS WILL BE ADAPTED TO A CNC MACHINING CENTER TO ADVANCE ITS PERFORMANCE KEYED TO PRESENT LEVELS OF EFFICIENCY. THIS WILL PROVIDE A PROVEN CAPABILITY WHICH CAN BE EMPLOYED ON OTHER MACHINES.	500 750 750 500

THE VILLAGE PLAN

THE USE OF SMALL QUANTITIES OF EXPLOSIVES IN A MINIMALLY INJURIOUS MANNER RESULTS IN HIGH COSTS AND SHORTLIVES OF TRANSPORT VEHICLES AND OR, UNFORTUNATELY, OF THE PERSONNEL THAT DELIVER THEM. EXTENDED DELIVERY SCHEDULES.

SITUATION - THE ARMY HAS AVAILABLE AND IS DEVELOPING A NUMBER OF CAD/CAM SYSTEMS, RELATED TO THE MANUFACTURE OF ITEMS FOR INITIAL ACQUISITION. THESE PROGRAMS WILL BE ADDRESSED TO SPARE PARTS ACQUISITION, T-100.

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THE VEHICLES ARE TRAILER COMBINATION AND PROVIDED IN SMALL QUANTITIES AND IN A CERTRALIZED STOCK. THIS FOCUSED PRACTICE RESULTS IN HIGH COSTS AND SHORTAGES DUE TO EXTENDED DELIVERY SCHEDULES.

ACQUISITION - The Army has available and is developing a number of CAUCAM techniques intended to facilitate the manufacture of items for initial acquisition. The CAUCAM programs will be altered to adapt parts acquisition to current procurement procedures.

FILE - AIR FORCE WEAPONS SYSTEMS INTEGRATION

SUMMARY - This methodology methodology is for the military vehicle manufacture, integration, and deployment of military contact gauges, namely employed. This represents 2

SECTION 1. THE T-2A VEHICLE MACHINING EQUIPMENT, E.G.C., PHOTOGRAPHY WILL BE USED FOR MEASUREMENTS AND ASSEMBLY OF COMPONENTS SUCH AS TOWING PLATES.

A. H. G. J. - 1970

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ALUMINUM CASTINGS REQUIRE TOLERANCES AND DIMENSIONS WHICH UTILIZE LARGER UNITS OF MATERIAL WHICH HAVE TO BE REMOVED FROM THE CASTINGS AND USE A COARSE CEMENT.

DUCTION - ESTABLISH MANUFACTURING PROCESSES UTILIZING LOW PRESSURE LASTING EFFECTS, THAT EASILY ELIMINATING THE USE FOR TOXIC GATING AND TACTICAL

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SECTION - CONSTRUCTION OF MAJOR COMPONENTS FOR BLAST HARDENED TCV
CONSTRUCTION SYSTEM. Current practice indicates that the system will have to be scaled-up. Main
feature of encapsulating equipment is to use the same elastomer and automatic
construction, as in Fig. 1.

1971 FIVE YEAR PLAN
RCS DIRECT 126

FUNDING (\$1000)

		P10K	P1	P2	P3	P4	P5
(CONTINUED)							
CONTRACT -- ROAD WHEEL							
(63) TITLE - AUTOMATED OBJECT INSPECTION OF ROAD WHEELS							
PROBLEM - THE ADHESION, SPECIFIC LOADABILITY, AND HAZARD TESTS ARE MADE ON LOTS CONTAINING NO MORE THAN 50 ROADWHEELS AND ALSO REQUIRE THE DESTRUCTION OF APPROXIMATELY 700 ROADWHEELS EACH YEAR.							
SOLUTION - ELIMINATE STRUCTURE LCT SAMPLING ACCEPTANCE BY THE IMPLEMENTATION OF AN ON-LINE, ULTRASONIC ROADWHEEL INFECTION SYSTEM.							
COMPONENT -- SPRINGS							
(64) TITLE - SPRINGS FROM CARBON-FIBER PLASTIC-COMPOSITES							
PROBLEM - STEEL SPRINGS FOR TACTICAL VEHICLES ARE HEAVY AND SUBJECT TO FAILURE FROM FATIGUE. CARBON FIBER COMPOSITES ARE LIGHTER AND HAVE EXCELLENT FATIGUE RESISTANCE.							
SOLUTION - THE TECHNOLOGY IS KNOWN TO MANUFACTURE LEAF SPRINGS FROM CARBON-FIBER PLASTIC-COMPOSITES, HOWEVER THE TECHNIQUES FOR MASS PRODUCTION NEED TO BE DEVELOPED.							
COMPONENT -- TIRE/TIRE INSTITUTE							
(65) TITLE - LIQUIDATING TIRE SPINS FROM HIGH STRENGTH STEEL							
PROBLEM - EXISTING ALLOY STEELS CAN BE HEAT TREATED TO A MAXIMUM WORKING STRENGTH WHICH RESULTS LARGE DIAMETER TIRES THEREBY INHIBITING WIDE DESIGN FIT, AND TIRE ASSEMBLY WEIGHT.							
SOLUTION - ESTABLISH METHODS OF LIQUIDATING TIRE SPINS UTILIZING QUADRATIC VEHICLE LOAD.							
(66) TITLE - PROTOTYPING TECHNIQUES FOR COMBAT VEHICLE SUSPENSION SYSTEMS							
PROBLEM - SUSPENSION SYSTEMS OF COMBAT VEHICLES ARE UNDERGOING A LARGE DESIGN CHANGE TO PROVIDE INCREASED MOBILITY PERFORMANCE BY UTILIZING NEWLY DEVELOPED COMPOSITES. APPLICATION OF THE ADVANCED SYSTEMS WILL INCREASE ACQUISITION COSTS.							
SOLUTION - APPLY ADVANCED MANUFACTURING TECHNIQUES TO REDUCE OR PREVENT INCREASE IN PRODUCTION COSTS.							
(67) TITLE - MANUFACTURING PROCESSES FOR METAL MATRIX COMPOSITES							
PROBLEM - METAL MATRIX COMPOSITES HAVE SELECTED COMPONENTS HAVING REFUSED WEIGHT AND INCHARGE THROUGH THE MANUFACTURING METHODS. FOR PRODUCTION MUST BE REVOLVED BY UPGRADING THE MANUFACTURING METHODS.							
SOLUTION - OVERCOME AND OPTIMIZE MANUFACTURING METHODS.							

NET FIVE YEAR PLAN
HCS (TCK) 126

FUNDING (\$000)

COMPONENT -- RUBBER

(456) TITLE: -- NON-PNEUMATIC (GOMAT) TIRES: FABRICATION TECHNIQUES

PROBLEM - PNEUMATIC TIRES ON TACTICAL VEHICLES ARE SUBJECT TO COMBAT DAMAGE.

SOLUTION - ESTABLISH PROCESSING TECHNIQUES TO ASSURE RELIABLE HIGH MOBILITY, NON-PNEUMATIC TIRES.

(457) TITLE - TIRE PRESERVATION COATING

PROBLEM - TIRE DETERIORATION FROM AGE AND WEATHER CAUSES INCLINABLE WASTEF.

SOLUTION - PRESERVATIVE COATINGS OFF LINCOLN PRODUCTS INC. NEED TO BE EVALUATED AND INCORPORATED INTO THE ARMY'S INVENTORY.

* DATE: 6/94 *

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COMPONENT -- RUBBER RINGS

223

(458) TITLE - RUBBER INJECTION MOLDING (E COUPLE PIN TRACK

PROBLEM - REWILL OF TRACK BLOCKS FOR COMBAT VEHICLES IS CURRENTLY BEING ACCOMPLISHED WITH 1440° S THERMOFORM. THIS REQUIRES THE BONDING OF RAW RUBBER TO THE TRAILER PLATE, EXPANDANT AND CONFRONTION CUTTING FOR TWO HOURS.

SOLUTION - ESTABLISH AN AUTOMATED (CNC) INJECTION MOLDING PROCESS THAT WILL CUT THE RUBBER TRACK PAD ON THE TRACK SHOT IN TEN MINUTES OR LESS.

(459) TITLE - WATER JET MATERIAL REMOVAL SYSTEM

PROBLEM - CURRENT PRODUCTION METHODS OF REMOVING RUBBER FROM TRACK COMPONENTS ARE LABOR INTENSIVE AND PRESENT ENVIRONMENTAL AND SAFETY HAZARDS TO THE WORKERS.

SOLUTION - DESIGN, WRITE SPECIFICATIONS AND FABRICATE A PROTOTYPE PRODUCTION HIGH PRESSURE WATER JET SYSTEM TO REMOVE THE RUBBER FROM THE TRACK COMPONENTS.

(460) TITLE - RUBBER FOR MILITARY TRACK

PROBLEM - TRACK LIFE IS HELD AT ITS EFFECTIVE LEVEL BY FAILURE OF RUBBER COMPONENTS SUCH AS PUSPINGS, PETS AND BLOCKS.

SOLUTION - ESTABLISH PRODUCTION PROCESSES FOR NEWLY DEVELOPED ELASTOMER COMPOUNDS FOR TRACKS.

COMPONENT -- RUBBER

FUNDING (\$000)

120 225

100

150

100

83

84

85

150

100

100

100

100

200 200

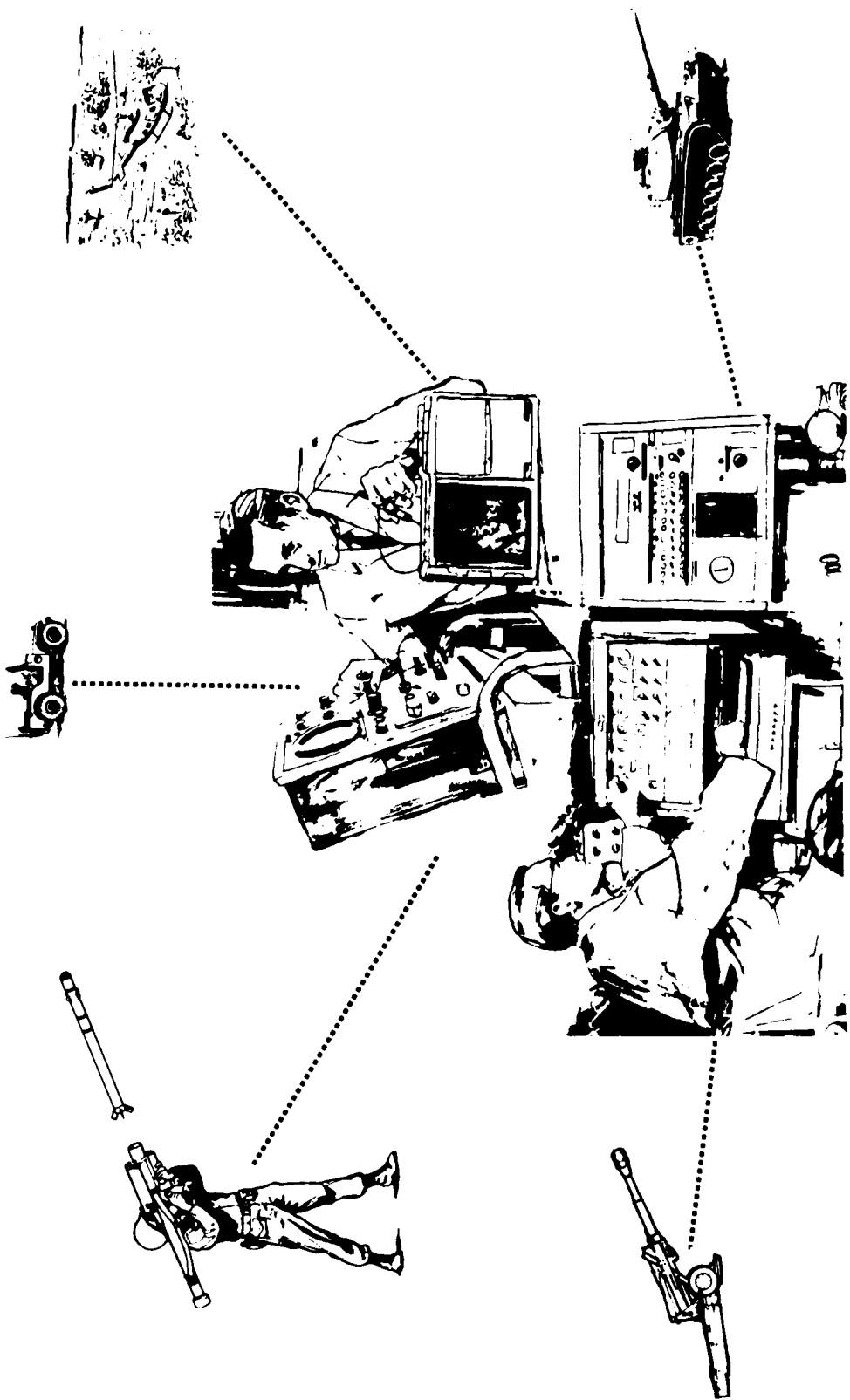
MAT FIVE YEAR PLAN
KLS ORCAT 126

FUNDING (\$GND)

COMPONENT -- SHOES

	PRIOR	E1	E2	E3	E4	E5	FUNDING (\$GND)
(4014) TITLE - AUTOMATED DISASSEMBLY OF DOUBLE PIN TRACK							
PROBLEM - DISASSEMBLY OF DOUBLE PIN TRACK SHOE SET ASSEMBLIES IS CURRENTLY LABOR INTENSIVE USING MANUAL HAND TOOLS RESULTING IN LOW PRODUCTIVITY.							
SOLUTION - ESTABLISH AN AUTOMATED DISASSEMBLY PROCESS FOR DOUBLE PIN TRACK SHOE ASSEMBLIES.							
(4513) TITLE - HIGH DENSITY POWDER METAL PARTS FOR COMBAT VEHICLES							
PROBLEM - TRACK COMPONENTS WEAR EXCESSIVELY REQUIRING THE TRACK TO BE ADJUSTED AND/OR REPLACED FREQUENTLY.							
SOLUTION - FABRICATE COMPONENTS BY COMPACTING HIGH WEAR ALLOYS FROM POWDER.							
(4514) TITLE - HARD FACING OF TRACK SHOES							
PROBLEM - NO DEFINITE PROCEDURE AND HARD FACING MATERIALS HAVE BEEN ESTABLISHED AS THE MOST SATISFACTORY AFFAIR COMBINATION FOR TRACK SHOES. PRIOR EFFORTS HAVE BEEN MADE IN BOTH THE USA AND EUROPE BUT NOTHING DEFINITE HAS RESULTED.							
SOLUTION - THE TRACK SHOE GROUSERS WILL BE BUILT UP BY DEPOSITION USING A HARD FACING PROCESS. THE PROCESS WILL BE AUTOMATED AND TOOLING WILL BE DESIGNED TO ALLOW THE EQUIPMENT TO FOLLOW THE CONTOURS OF THE TRACK SHOE GROUSERS.							
(5143) TITLE - FABRICATION TECHNIQUES FOR NON METALLIC TRACK							
PROBLEM - CURRENT METALLIC TRACK CONTRIBUTES A LARGE PERCENTAGE OF TOTAL VEHICLE WEIGHT.							
SOLUTION - VALIDATE FABRICATION FEASIBILITY FOR BUILDING AN ALL PLASTIC COMBAT VEHICLE TRACK							
(5154) TITLE - LASER SURFACE HARSHENING COMBAT VEHICLE COMPONENTS							
PROBLEM - PRESENT METHODS OF SURFACE HARSHENING INPUTS HEAT OVER LARGE SURFACE AREA.							
SOLUTION - ESTABLISH LASER BEAM HARSHENING PROCEDURES WITH ITS ATTENDANT FINER BEAM SMALL AREAS &ATIC HEATING.							
(5162) TITLE - QUASICAST PRECISE CASTING FOR COMBAT VEHICLE PARTS							
PROBLEM - PRECISE CASTING UTILIZING INTERNAL REINFORCEMENTS HAVE NOT BEEN DEVELOPED.							
SOLUTION - PRODUCTION TECHNIQUE WILL BE DEVELOPED TO PRODUCE CASTINGS OF NEAR NET SHAPE WITH REINFORCEMENTS.							

**TEST AND EVALUATION COMMAND
(TECOM)**



<u>CATEGORY</u>	<u>PAGE</u>
Testing-----	229

US ARMY TEST AND EVALUATION COMMAND

(TECOM)

TECOM, with headquarters at Aberdeen Proving Ground, MD, is the primary developmental testing agency for the US Army. TECOM plans, conducts, and reports on development tests performed during the life cycle of Army materiel, and evaluates foreign materiel for possible US acquisition. Additional testing is performed as a service to the commodity commands upon their request. The testing organization consists of the aircraft development test activity, three environmental testing activities, five proving grounds (one of which serves as the third environmental activity), and a national missile range. Facilities are located in the continental United States, the Panama Canal Zone and Alaska.

Individual investigations into production test procedures and evaluation techniques are accomplished through TECOM's MMT program. In view of TECOM's mission and the intended results of the MMT efforts (to improve test procedures), the majority of the work is accomplished in-house.

TECOM's MMT efforts are grouped under two general headings: documentation and resource conservation. Individual efforts are funded from these "parent programs." Current funding constrains TECOM to an annual program that supports approximately one-half of their planned efforts.

TECOM
COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY81	FY82	FY83	FY84	FY85
TESTING	750	1010	1300	1400	1500
TOTAL	750	1010	1300	1400	1500

* C A T E G O R Y *
* T E S T I N G *
* *****
COMPONENT -- DOCUMENTATION

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000's)

	PRIOR	F1	F2	F3	F4	F5

(5072) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

PROBLEM - STANDARD TEST PROCEDURES ARE REQUIRED TO INSURE THAT TEST ACTIVITIES COLLECT DATA AND CONDUCT TESTS IN A UNIFORM MANNER TO SUPPORT THE DT EVALUATION PROCESS. ACCEPTANCE TEST PROCEDURES ARE REQUIRED TO VERIFY FRN HARDWARE SPECIFICATION COMPLIANCE.

SOLUTION - MAINTAIN TEST OPERATIONS PROCEDURES AND ACCEPTANCE TEST PROCEDURES TO TEST SYSTEMS FOR SPECIFICATION COMPLIANCE.

COMPONENT -- RESOURCE CONSERVATION

(5071) TITLE - TECOM PRODUCTION METHODOLOGY ENGINEERING MEASURES

PROBLEM - ARTILLERY VEHICLE AND ELECTRONIC CONVENTIONAL TEST CAPABILITIES NEED TO BE UPGRADED TO PROVIDE MORE TIMELY ACCURATE TEST DATA FOR THE TEST AND EVALUATION PROCESS.

SOLUTION - DEVELOP A PROGRAM TO UPGRADE CONVENTIONAL TEST CAPABILITIES AT THE TEST ACTIVITIES.

(5073) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

PROBLEM - FIELD TESTING COMPLEX WEAPON SYSTEMS IS COST PROHIBITIVE. SIM TECHNIQUES MUST BE DEVELOPED TO REDUCE THE COST AND MANPOWER REQUIRED TO PERFORM GOVT TESTS. PDR TEST PROCESSES MUST BE AUTOMATED BECAUSE OF PERSONNEL REDUCTIONS AT TEST ACTIVITIES.

SOLUTION - DEVELOP SIMULATION TECHNIQUES TO TEST COMPLEX WEAPON SYSTEMS AND AUTOMATE PRODUCTION TEST PROCESSES.

APPENDICES

INDUSTRY GUIDE

This section of the MMT Program Plan explains the Army programming cycle for the MMT Program. The objective of the MMT Program is to develop new manufacturing methods and processes that will reduce the cost of producing weapon systems. The program consists of approximately 200 projects annually that concentrate on improving and/or developing manufacturing methods, techniques and processes.

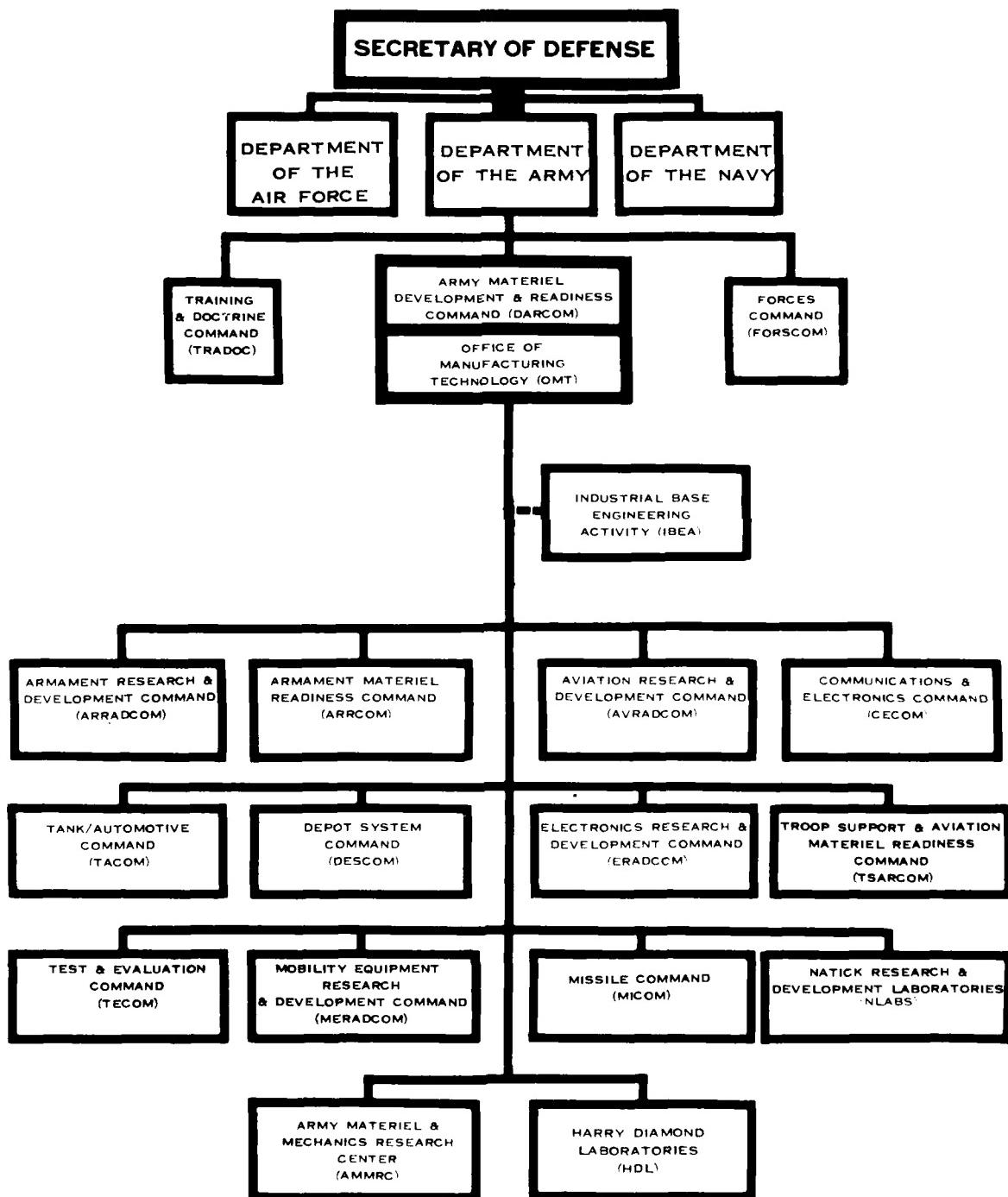
The scope of the MMT Program covers all three of the military services. Within the Army, the Office of Manufacturing Technology (OMT) has been established to provide overall program responsibility. Functional responsibility is at the commodity oriented, Major Subcommands (SUBMACOM'S). The SUBMACOM'S plan, formulate, budget, and execute individual projects. The Industrial Base Engineering Activity (IBEA) assists OMT on the technical aspects of the Manufacturing Technology Program. The organizational chart on the next page depicts this supporting framework.

Throughout the Program Plan reference is made to various appropriations. These appropriations are identified in the Army Management Structure (AR 37-100-FY) and are established by the US Congress as a standard accounting system. Most MMT efforts are funded through the Procurement Appropriations which include (1) Aircraft, (2) Missile, (3) Weapons and Tracked Combat Vehicles, (4) Ammunition, and (5) Other. A few projects receive funds for the Operations Maintenance, Army (OMA) appropriation.

Identification of manufacturing problems is the first step in developing an MMT Program. Problem areas are conceptualized and compiled into a planning document (the Program Plan). At the date of the publication, the Program Plan contains one funded year, one programmed year and three planned years. As the program cycle proceeds the concepts are refined and project proposals are developed. A diagram depicting this programming cycle is shown on page A-3. To fully understand the entire programming cycle one must realize that DOD budgets on a Fiscal Year (FY). The FY starts on 1 October and ends the last day of the following September. For example, on 1 October 1980, the Army began the first quarter of FY81.

The following programming cycle chart depicts the various activities and stages that MMT projects go through. Concepts are first identified in the five year plan according to the projected year funding is expected. Each year these concepts are reevaluated and move forward until they reach the budget phase. Industry has the opportunity to participate during the annual MTAG conference. At this gathering the current program, the latest budget project and the Program Plan are discussed.

UNITED STATES ARMY MATERIEL DEVELOPMENT & READINESS COMMAND (DARCOM)



Calender Year Activities
MMT Planning/Budgeting/Review Cycle

YEARLY ACTIVITIES

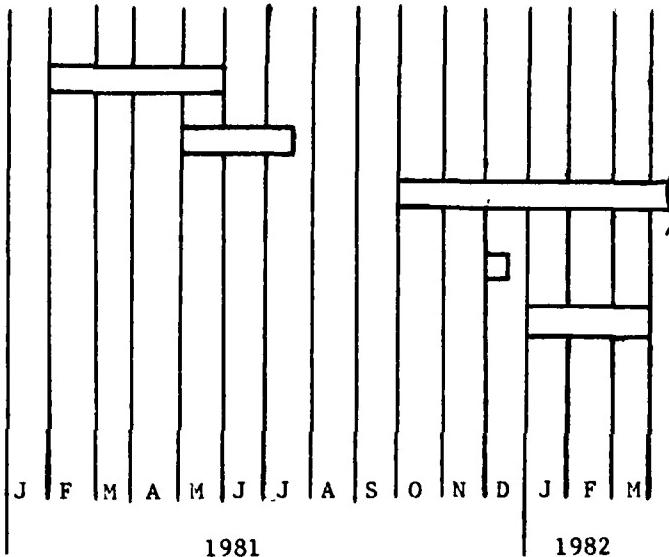
Program Plan (FY81-85)

FY83 Budget Submission/Review

FY82 MMT Funds Released

MTAG Annual Conference

FY83 Apportionment Submission/
Review



The programming cycle shown above starts with the Program Plan. This document consolidates individual submissions from the SUBMACOM'S and develops the planned program. Because Army budget guidance provides "ceilings," potential projects must be prioritized which results in some being excluded or slipped. Inclusion in the Plan does not guarantee that the project will be funded. The level of funding is dependent upon what Congress will appropriate each year.

As projects approach the start of the funding cycle specific objectives and work scopes are developed. These projects are documented in what is known as a P-16. A P-16 is simply the format that is utilized to document data elements such as estimated cost, economics, and description of work. (The P-16 format is described in AR 700-90).

The budget submission represents the first P-16 submitted for inclusion in the program. This submission is followed about nine months later by the more definite apportionment submission. Projects are then funded when the new fiscal year begins. Although this is the normal planning cycle, a project can enter the planning cycle at any point in time. Such a project would be known as a late start submission and funding is usually at the expense of another project.

Criteria for actually funding individual projects include technical, operational, and economical feasibility. The potential for technical success, the means by which the results will be implemented, the potential payback or return on investment and the interrelationships that exist between factors are all evaluated.

For a more comprehensive understanding of the MMT program, the following list of documents is provided for reference:

DOD Instruction 4200.15, Manufacturing Technology Program

AR 700-90, The Army Industrial Preparedness Program

AR 37-100, The Army Management Structure

AR 11-28, Economic Analysis and Program Evaluation for Resources Management

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